

## Affected Environment (Primary Impacts)

This chapter identifies potential primary impacts to environmental resources and the affected community from the proposed alternatives. This chapter addresses both direct primary impacts (the loss of a resource) and, where feasible, indirect primary impacts (changes in the function or quality of a resource). The chapter includes analyses of transportation, air quality, noise, important natural and biological resources, land use, social and economic resources, cultural resources, construction impacts, and energy impacts. Where impacts are correlated with area, the width of new right-of-way, or the width of new pavement, is used to estimate areas of impact.

---

### 3.1 Transportation

This section briefly describes existing transportation conditions within the study area, summarizes the methodology used to establish existing and future transportation conditions, and compares the effects of the 6 Draft EIS alternatives on the existing roadway system. The *Transportation Evaluation Technical Report* (Available for review at Town Halls and public libraries within the study area, and at ConnDOT) contains additional information and detailed analysis of the transportation effects of the 6 alternatives.

---

#### 3.1.1 Existing Conditions

The analysis of existing conditions demonstrates that the study area has and is expected to continue to experience substantial traffic volume growth on both major and secondary roadways. Continued growth at the Foxwoods Resort Casino, at the Mohegan Sun Resort, and at other development nodes throughout the region will increase travel demands on major roadways and will tend to spread the demand to other arterial and secondary roadways. The transportation analysis focused on the Routes 2, 2A, 32, and 164 corridors.

**3.1.1.1 Route 2**

Route 2 is the principal arterial route through the study area, connecting to I-95 to the south, and to I-395 and Hartford to the north. Route 2 has long experienced periods of traffic congestion, which have become worse and more frequent with the development of the Foxwoods Resort Casino. Route 2 has geometric deficiencies and safety problems that contribute to poor operating conditions on the corridor.

Additional traffic volume increases are projected on Route 2 by the year 2020, which are expected to result in severe congestion, increased delays, and a further deterioration in safety along the roadway. Between Norwich and I-95, Route 2 is projected to operate over capacity.

**3.1.1.2 Route 2A**

Route 2A provides the only crossing of the Thames River between New London and Norwich. As a result, traffic volumes on Route 2A have nearly doubled since the early 1990s, and are expected to increase further by the year 2020. Expansion at the Mohegan Sun Resort, spin-off development in Montville and Preston, and anticipated redevelopment at the Norwich State Hospital site are all expected to place increased travel demands on Route 2A. The traffic volume increases are expected to result in severe congestion, increased delays, and a deterioration in safety on Route 2A. In the future, Route 2A is projected to operate above capacity.

**3.1.1.3 Route 32**

Route 32 has been little affected to date by the development of the region's two casinos, and continues to operate below capacity. The roadway does have existing geometric deficiencies and safety problems. In the future, as additional development is completed at the Mohegan Sun Resort and spin-off development spreads to Route 32, the roadway will likely experience additional travel demands. Traffic volumes on Route 32 are projected to increase by approximately 25 percent by the year 2020, and the roadway is expected to be operating very close to capacity.

**3.1.1.4 Route 164**

For motorists from the north, Route 164 is a preferred route to reach Foxwoods and eastern portions of the study area because it is shorter than other routes. As a result, traffic volumes on Route 164 have doubled since the early 1990s. Route 164 is currently operating below capacity, although it does have geometric deficiencies and safety problems. Additional traffic volume

increases are projected on Route 164 by the year 2020, and the roadway is expected to be approaching capacity.

---

### **3.1.2 Methodology**

The ConnDOT statewide travel demand forecasting model was used to predict future traffic volumes on study area roadways for the year 2020. This section briefly describes the modeling methodology. More detail is provided in the *Transportation Evaluation Technical Report*.

The model uses a schematic roadway network of major and secondary roads within the state, and a detailed zone structure with various load points for trips from each zone to enter the roadway network. All towns within the state are broken down into smaller zones. The model uses population, household, and employment data from each zone to generate a trip table, which represents the travel demand on a daily basis between all zones in the model. Travel demands, or trips, are then assigned to the roadway network, taking into account the roadway characteristics (i.e., capacity) and travel times to determine the most likely route a trip might take from one place to another.

To ensure that travel patterns were accurately modeled, a base-year model (1999) was first developed and its output compared with actual 1998 traffic volume counts. Adjustments were made, as necessary, to calibrate the model so that the model simulated the observed traffic counts as closely as possible. Once the existing model was calibrated within the study area, changes were made to the model to represent future conditions for all 6 alternatives, as described below.

#### **3.1.2.1 Alternative A**

Alternative A, the 2020 No-Action condition, includes 3 changes to the model: recent and planned roadway improvements (which included the widening of Route 2 between Route 164 and Route 214, the widening of Route 2 between I-95 and Route 78, and the upgrade of Route 32 south of the I-395 Connector) and the future land use changes discussed in Section 1.4.3 (which result in growth in population and employment by the year 2020). The model was run with these changes incorporated to estimate future travel demands and traffic volumes for the year 2020.

#### **3.1.2.2 Analysis of Alternatives**

The statewide model was also used to project future traffic volumes on study area roadways for the year 2020 under each of the 5 Build alternatives, and to project future transit ridership for the transit alternatives. For each

alternative, the model was modified to incorporate the capacity increases and/or new transit services included. Additional detail is provided below.

### **Transit Modeling Methodology**

Alternatives B, C, and D include new transit services and minor upgrades to existing roadways. For these alternatives, a schematic transit network was created, representing the proposed transit system's points of access (stations), carrying capacity per hour, and travel times. Minor increases in capacity were made on the roadway segments being upgraded as part of Alternatives B, C, and D. When modeling transit ridership, an additional step in the modeling process is necessary that takes into account a mode split calculation that separates trip tables by vehicle trips and transit trips. The transit trip table is then assigned to the transit network and the vehicle trip table is assigned to the roadway network.

Several assumptions were made as part of the transit modeling, including:

- Transit service will be provided 24 hours a day on 20-minute headways.
- Parking at transit stations will be free of charge.
- The on-site patron parking capacity at the Foxwoods Resort Casino and at the Mohegan Sun Resort will continue to increase to meet the demand for parking.
- All casino patrons have the choice to park in a remote location and use transit even though parking is available on site at the casinos.
- Incentives to use transit will be provided for casino patrons. The incentives may be in the form of free or reduced transit fares, or in the form of credits at the casinos. If through credits at the casinos, the credit was assumed to be significant enough to offset the transit fares.
- Foxwoods will maintain its current policy of requiring off-site parking for its employees. Where a transit line serves an off-site employee parking lot, trips from the employee lot would be diverted to the new transit service, rather than to the existing employee shuttle service.

### **Highway Modeling Methodology**

Alternatives E and F include widened and upgraded roadways, and the construction of new, bypass roadways. For these alternatives, the new roadways were added to the model's schematic roadway network, and capacity increases were made to existing roadways to reflect the widenings and upgrades.

### 3.1.3 Consequences

This section presents a comparison of the 6 alternatives in terms of projected 2020 traffic volumes and operations on the key study area corridors. Operations are presented in terms of volume to capacity (V/C) ratios. V/C ratios compare the hourly volume with the hourly capacity of a roadway. Table 3.1-1 summarizes the projected traffic volumes and V/C ratios, and [Figures 3.1-1](#) through [3.1-5](#) illustrate the V/C ratios graphically for each of the 5 Build alternatives (note that [Figure 1.4-3](#) illustrated V/C ratios for 1998 existing conditions and [Figure 1.4-4](#) illustrated V/C ratios for the 2020 No-Action alternative). Table 3.1-2 presents the estimated daily transit trips for the 3 transit alternatives. Principal results for each alternative are described below.

#### 3.1.3.1 Alternative A (No-Action)

The principal results of the No-Action alternative were described in Chapter 1. The results are summarized below:

- Substantial growth in traffic volumes is expected to continue.
- Traffic volumes are expected to exceed the capacity of Route 2 throughout Norwich, Preston, and North Stonington.
- Traffic volumes are also expected to exceed the capacity of Route 2A.
- Route 32 and Route 164 are expected to be approaching capacity.
- Traffic demands on local, residential roads are expected to increase, resulting in operational issues, safety concerns, and potential changes in the roadways' rural/residential nature.

#### 3.1.3.2 Alternative B (Rail/Transit)

Alternative B includes a light rail option and a monorail option. Daily ridership for Alternative B is estimated to be 13,514 trips (6,757 passengers). The effects of Alternative B are described below and included in Table 3.1-1 and [Figure 3.1-1](#). Alternative B would reduce traffic volumes on Route 2 through North Stonington by approximately 4,000 vpd, and on Route 2A through Poquetanuck by about 2,400 vpd. Traffic volumes on Route 32 are projected to decline slightly, by about 300 vpd. However, even with these traffic volume reductions and the slight increase in capacity as a result of the upgrade to Route 2, Routes 2 and 2A are expected to continue to operate above capacity under Alternative B.

This page intentionally left blank

**TABLE 3.1-1 GETS INSERTED HERE.**

**IT IS AN EXCEL FILE:**

**\\40185\DOCS\REPORTS\TRANSPSUMMARYTABLE.XLS**

**AND IT IS THE FIRST TAB IN THE WORKBOOK, CALLED:**

**“DEIS CH3.1 TABLE 3-1 FORMATTED”**

**[Remove this page]**

**Place holder for the back of table 3.1-1**

Alternative B results in improved roadway operations in just 1 location in the study area, Route 2 between Route 164 and Route 2A, where operations improve from above capacity to approaching capacity as a result of the reduction in traffic volume.

**Table 3.1-2**  
**Daily Transit Trips (2020)**

Trip Type	Alternative B	Alternative C	Alternative D
Casino Patrons	9,406	9,872	4,004
Casino Employees	1,506	1,504	5,936
Regional Commuters	1,714	2,060	434
Other	888	1,086	68
Total Trips	13,514	14,522	10,442
Total Passengers	6,757	7,261	5,221

### 3.1.3.3 Alternative C (Rail/Transit with Bridge Connection)

Alternative C also includes a light rail option and a monorail option. Daily ridership for Alternative C is estimated to be 14,522 trips (7,261 passengers). The increase in ridership from Alternative B to Alternative C results from the direct system connection via the rail bridge over the Thames River. Approximately 1,000 additional daily trips are projected if a rail bridge is constructed.

As shown in Table 3.1-1, Alternative C is projected to reduce traffic volumes on Route 2 through North Stonington by approximately 4,300 vpd, and on Route 2A through Poquetanuck by about 2,600 vpd. Traffic volumes on Route 32 are projected to decline slightly, by about 400 vpd. However, similar to Alternative B, even with these traffic volume reductions and the slight increase in capacity as a result of the upgrade to Route 2, Routes 2 and 2A are expected to continue to operate above capacity under Alternative C.

Alternative C results in improved roadway operations in just 1 location in the study area, Route 2 between Route 164 and Route 2A, where operations improve from above capacity to approaching capacity as a result of the reduction in traffic volume. Other than in this location, Alternative C does not improve operating conditions. [Figure 3.1-2](#) illustrates roadway operations under Alternative C.

#### **3.1.3.4 Alternative D (Bus Transitway)**

Daily transit ridership for Alternative D is estimated to be 10,442 trips (5,221 passengers). The composition of trip purposes for Alternative D is different than Alternatives B and C because Alternative D, by connecting to the Foxwoods Norwich Lot on Route 2, serves a larger number of casino employees. Nonetheless, Alternative D is estimated to have the lowest ridership of the three transit alternatives under consideration, because it does not include service west of the Thames River (i.e., no service to the Mohegan Sun Resort), nor does it connect to the Norwich State Hospital site. The effects of Alternative D are described below and included in Table 3.1-1 and [Figure 3.1-3](#).

Alternative D is expected to reduce traffic volumes on Route 2 through North Stonington by 4,000 vpd. Alternative D is not expected to reduce traffic volumes on Route 2A through Poquetanuck because the busway does not serve this corridor. Like Alternatives B and C, even with these traffic volume reductions and the slight increase in capacity as a result of the upgrades to Route 2, Routes 2 and 2A are expected to continue to operate above capacity under Alternative D.

Alternative D results in improved roadway operations in just 2 locations in the study area. Other than in these locations, Alternative D does not improve operating conditions.

- Route 2 between Route 2A and Route 165, where operations improve from above capacity to below capacity as a result of the reduction in traffic volume and upgrade to this portion of Route 2.
- Route 2 between Route 164 and Route 2A, where operations improve from above capacity to approaching capacity as a result of the reduction in traffic volume.

#### **3.1.3.5 Alternative E (Route 2A Bypass and Route 2 Widening)**

Alternative E includes widening Route 2 and a Route 2A Bypass. The effects of each are discussed below. The overall effects of Alternative E are presented in Table 3.1-1 and in [Figure 3.1-4](#).

Widening Route 2 between Route 214 and I-95 results in approximately 40,700 vpd through North Stonington (an additional 5,500 vpd over the No-Action alternative). However, operations on this portion of Route 2 are improved as a result of the widening to four lanes. Under Alternative E, the segment between Route 201 (Cossaduck Road) and I-95 would begin to approach capacity, while the segment from Route 214 to Cossaduck Road would be under capacity.

A Route 2A Bypass has effects on several different roadways. The bypass would reduce traffic on Route 2A through Poquetanuck by about 12,900 vpd from the No-Action alternative, resulting in traffic volumes on Route 2A that are 6,100 vpd lower than 1998 traffic volumes and similar to volumes observed in the early 1990s. The Route 2A Bypass would also reduce traffic volumes on Route 214, Route 164, and Route 2 between Route 2A and Route 165 in Norwich (by providing a more attractive, limited-access route to the eastern study area).

Alternative E also results in an increase of 6,800 vpd on the Mohegan-Pequot Bridge. However, operations on the bridge are expected to improve as a result of the widening to four lanes to approaching capacity conditions under Alternative E.

Alternative E would also increase traffic on Route 2 between Route 164 and Route 2A, but would result in improved operations along this section of Route 2 due to the four-lane widening. This portion of Route 2 would improve from failing conditions to below-capacity conditions under Alternative E.

#### **3.1.3.6 Alternative F (Route 2A Bypass and Route 2 Bypass)**

Alternative F includes a Route 2 Bypass and a Route 2A Bypass. The effects of each are discussed below. The overall effects of Alternative F are presented in Table 3.1-1 and in [Figure 3.1-5](#).

A Route 2 Bypass would result in a substantial reduction of traffic on Route 2 through North Stonington. Under Alternative F, the bypassed portion of Route 2 is projected to carry approximately 14,500 vpd (20,700 vpd below the No-Action alternative, and 9,900 vpd below existing conditions). Operations on this portion of Route 2 would improve from failing conditions to below-capacity conditions under Alternative F.

A Route 2A Bypass has effects on several different roadways. The bypass would reduce traffic on Route 2A through Poquetanuck by about 12,900 vpd from the No-Action alternative, resulting in traffic volumes on Route 2A that are 6,800 vpd lower than 1998 traffic volumes and similar to volumes observed in the early 1990s. The Route 2A Bypass would also reduce traffic volumes on Route 214, Route 164, and Route 2 between Route 2A and Route 165 in Norwich. Alternative F also results in an increase of 9,900 vpd on the Mohegan-Pequot Bridge. However, operations on the bridge are expected to improve as a result of the widening to four lanes, from failing conditions to approaching capacity conditions under Alternative F.

Alternative F would also increase traffic on Route 2 between Route 164 and Route 2A, but would result in improved operations along this section of Route 2 due to the four-lane widening. This portion of Route 2 would

improve from failing conditions to below capacity conditions under Alternative F.

---

### **3.1.4 Comparison of Alternatives**

This section compares the effects of the alternatives at several key locations in the study area to assess which alternative(s) provides the best operating conditions at each of these key locations.

#### **3.1.4.1 Route 2 Through North Stonington (Between Route 201 at Cossaduck Road and Route 184)**

Figure 3.1-6 shows a comparison of the 6 alternatives in terms of their effects on Route 2 through North Stonington (between Route 201/Cossaduck Road and Route 184). This location is discussed to illustrate the effects of widening Route 2, a Route 2 Bypass, and transit. The major findings are:

- Alternative A is expected to result in failing (above capacity) operations on this portion of Route 2.
- Alternatives B, C, and D are expected to reduce traffic volumes through North Stonington by 3,800 to 4,000 vpd, but would leave this portion of Route 2 with failing operations. The upgrade of Route 2 would have a positive impact on safety.
- Alternative E is expected to increase traffic volumes through North Stonington, as traffic shifts from secondary roadways to the widened Route 2. Operating conditions under Alternative E improve as a result of the widening. Safety is expected to improve as vehicle conflicts are reduced.
- Alternative F is expected to result in a substantial reduction of traffic on this portion of Route 2 by 20,700 vpd (to levels below existing conditions), and to result in a major improvement in operating conditions and safety through North Stonington.

#### **3.1.4.2 Route 2 Through Preston (Between Route 2A and Route 164)**

Figure 3.1-7 shows a comparison of the 6 alternatives in terms of their effects on Route 2 in Preston (between Route 2A and Route 164). This location is discussed to illustrate the effects of a Route 2A bypass, a Route 2 widening through Preston, and transit. The major findings are:

- Alternative A is expected to result in failing (above capacity) operations on this portion of Route 2.
- Alternatives B, C, and D are expected to reduce traffic volumes slightly on this portion of Route 2, and to result in operating conditions that approach capacity.
- Alternatives E and F are expected to result in increased traffic volumes on this portion of Route 2, as traffic shifts to the Route 2A Bypass and this widened portion of Route 2, and to result in major improvements in operating conditions and safety.

#### **3.1.4.3      Route 2A Through Poquetanuck (Between Route 12 and Route 117)**

Figure 3.1-8 shows a comparison of the 6 alternatives in terms of their effects on Route 2A through Poquetanuck (between Route 12 and Route 117). This location is discussed to illustrate the effects of a Route 2A bypass and transit. The major findings are:

- Alternative A is expected to result in failing (above capacity) operations on Route 2A through Poquetanuck.
- Alternatives B and C are expected to reduce traffic volumes slightly through Poquetanuck (2,400 to 2,600 vpd) but would leave this portion of Route 2A with failing operations. The reduced traffic volumes would result in minor safety benefits.
- Alternative D is not expected to reduce traffic through Poquetanuck and would leave this portion of Route 2A with failing operations.
- Alternatives E and F, both of which include a Route 2A Bypass, are expected to result in a substantial reduction of traffic through Poquetanuck to levels below existing conditions (12,300 to 12,900 vpd), and to result in a major improvement in operating conditions and safety.

#### **3.1.4.4      Route 32 In Montville (Between Route 2A and Route 163)**

Figure 3.1-9 shows a comparison of the 6 alternatives in terms of their effects on Route 32 between Route 2A and Route 163. The major findings are:

- Alternative A is expected to result in operating conditions approaching capacity on this portion of Route 32.
- Alternatives B and C are expected to reduce traffic volumes slightly on this portion of Route 32. Alternatives B and C would result in slight improvements in the V/C ratios, but would leave Route 32 with operating conditions approaching capacity.

- Alternative D is not expected to reduce traffic volumes on Route 32, and would leave this portion of Route 32 with operating conditions approaching capacity.
- Alternatives E and F are expected to result in minor traffic volume increases on this portion of Route 32, and to leave Route 32 with operating conditions approaching capacity. The upgrade of Route 32 associated with Alternatives E and F will improve safety.

#### 3.1.4.5 Route 164 in Preston (Just North of Route 2)

Figure 3.1-10 shows a comparison of the 6 alternatives in terms of their effects on Route 164 in Preston. The major findings are:

- Alternative A is expected to result in operating conditions approaching capacity.
- Alternatives B, C, and D are not expected to reduce traffic volumes on Route 164.
- Alternatives E and F, which include a Route 2A Bypass, are expected to result in minor traffic volume reductions on Route 164, and operations below capacity. The upgrade would also improve safety.

---

#### 3.1.5 Summary

This section ranks the 5 Build alternatives strictly from a transportation perspective, focusing on resulting traffic operations and safety.

**Alternative F** is expected to have the greatest improvement in traffic operations and safety, resulting in major reductions in traffic volumes on Route 2 through North Stonington, and on Route 2A through Poquetanuck. Consequently, traffic operations and safety are expected to improve in both locations. Operations are expected to improve on other study area roadways as well, including: Route 2 between Route 164 and Route 2A, Route 32, Route 164, Route 214, and Route 117. Safety improvements are likely on upgraded portions of Route 32 and Route 164. With major improvements in operations and safety along Route 2 and 2A, minor improvements in operations on Route 164, and improvements in safety on Route 32, Alternative F meets the project purpose and need.

**Alternative E** ranks a close second in terms of improvements in traffic operations and safety. Alternative E is expected to result in improved traffic operations on Route 2, Route 2A, Route 164, Route 217, and Route 117. Like Alternative F, Alternative E results in a major reduction in traffic volumes on Route 2A through Poquetanuck. Consequently, traffic operations and safety

are expected to improve here. Safety improvements are also likely on upgraded portions of Route 32 and Route 164. The key difference between Alternatives E and F is that Alternative F results in better operating conditions on Route 2 through North Stonington because the Route 2 Bypass provides more capacity than the widening and provides better separation of through traffic and local traffic. With major improvements in operations and safety along Route 2 and 2A, minor improvements in operations on Route 164, and improvements in safety on Route 32, Alternative E meets the project purpose and need.

**Alternative C** ranks third in terms of improvements in traffic operations and safety. Alternative C is expected to result in slightly reduced traffic volumes on Route 2, Route 2A, and Route 32, and no change to Route 164 volumes. These traffic volume reductions, however, result in only marginal improvements in roadway operations. Minor safety improvements are likely on the upgraded portions of Route 2. With only marginal improvements in safety on Route 2, Alternative C only partially meets the project purpose and need.

**Alternative B** ranks fourth in terms of improvements in traffic operations and safety, with results nearly identical to Alternative C. The only difference between Alternatives B and C is that Alternative C has slightly higher transit ridership, resulting in a small number of additional vehicles being removed from the existing roadway system. With only marginal improvements in safety on Route 2, Alternative B partially meets the project purpose and need.

**Alternative D** ranks fifth in terms of improvements in traffic operations and safety. Alternative D is expected to result in minor traffic volume reductions on Route 2, but leaves volumes on Route 2A, Route 32, and Route 164 unchanged. The traffic volume reductions result in only marginal improvements to traffic operations on Route 2. Minor safety improvements are likely on the upgraded portions of Route 2. Alternative D also has the lowest transit ridership of the three transit alternatives. With only marginal improvements in safety on Route 2, Alternative D only partially meets the project purpose and need.

**Alternative A** results in substantial growth in traffic volumes over existing conditions. On Route 2, traffic volumes are projected to exceed the capacity of the roadway through Norwich, Preston and North Stonington. Traffic volumes are also projected to exceed the capacity of Route 2A from west of the Mohegan-Pequot Bridge to Route 2. Route 32 and Route 164 are expected to be approaching capacity. Operations at signalized and unsignalized intersections are projected to worsen, causing drivers to face increased delays, particularly when attempting turns to and from side streets and driveways. The traffic volume increases are also expected to result in a deterioration in safety along the study area roadways. Consequently, Alternative A does not meet the project purpose and need.

---

## 3.2 Wetlands

Wetlands, watercourses and waterbodies may provide a variety of functional values, such as wildlife habitat, fish habitat, educational potential, visual/aesthetic quality, water-based recreation, flood flow desynchronization, groundwater and surface water use potential, nutrient retention, sediment trapping, shoreline stabilization and dissipation of erosive forces, forestry potential, and archaeological potential. Ecological functions and societal values vary with each wetland. Factors affecting wetland function include size, location in the watershed, number and interspersions of plant cover types, and the degree of disturbance.

This section evaluates existing wetland conditions within the study area, describes the project wetland impacts, and discusses potential wetland mitigation measures. The *Wetland Technical Report* (Available for review at Town Halls and public libraries within the study area, and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation.

---

### 3.2.1. Methodology

For this study, wetlands and watercourses meeting either state or federal jurisdictional definitions have been mapped using data from the United States Department of Agriculture Soil Survey, United States Fish and Wildlife Service (USFWS) National Wetland Inventory, aerial photographs, and Mashantucket Pequot Tribal Nation wetland maps. Field reconnaissance was conducted during June through August of 1998. Wetland boundaries were field reviewed and checked against aerial photographs and field notes to ensure accuracy. Wetland types in the study area have been identified according to the USFWS classification system and functions and values have been assessed according to the methodology provided in the ACOE Highway Methodology Supplement.

---

### 3.2.2 Existing Wetlands

There are 181 wetlands within the study area corridors ([Figure 3.2-2](#)).

**Note that [Figure 3.2-1](#) provides a key to all following graphics showing environmental resources and impacts. Note also that impacts are illustrated for the Route 2 Widening element in North Stonington [between Route 214 and I-95], and not for the lesser-impact Route 2 Upgrade element in this location.**

Most of these resources are palustrine forested and palustrine emergent wetlands in Stonington and North Stonington. Larger contiguous forested wetlands with high quality resources include the Ledyard Cedar Swamp in Ledyard and the Assekunk Swamp in North Stonington. CTDEP designates communities with unique, high quality resources as “Significant Natural Communities”. In the study area, the northeastern portions of Poquetanuck Cove in Preston and the Ledyard Cedar Swamp in Ledyard are considered Significant Natural Communities (Section 3.6 of this Draft EIS provides additional information on Significant Natural Communities).

The majority of study area wetlands are associated with the numerous named and unnamed streams and river segments. Many of these watercourses are small intermittent streams and low gradient perennial streams that transect and drain forested wetlands. Major watercourses in the corridor include the Thames River, Assekunk Brook, Anguilla Brook, Shewville Brook, Shunock River, Indiantown Brook, and the Pawcatuck River.

Table 3.2-1 summarizes the existing wetlands in the study corridor.

**Table 3.2-1  
Summary of Existing Wetlands in the Study Area**

Study Corridor	Number of Wetlands	Wetland Types	Key Functions	Comments
Transitway	59	Palustrine Forested Scrub-Shrub	Fish and wildlife habitat Floodflow alteration Groundwater recharge	Large scrub-shrub wetlands found along Shewville Brook, Shunock River and Lantern Hill Brook
Route 32	10	Palustrine Forested Palustrine Emergent	Floodflow alteration/ Fish and wildlife habitat	Most wetlands associated with highway drainage swales and found along channel margins
Route 164	14	Palustrine Forested	Floodflow alteration Wildlife habitat Aesthetics	Most wetlands associated with depressional landforms and human-made ponds
Route 2	45	Palustrine Emergent	Fish and wildlife habitat	Most wetlands associated with depressional landforms and stream corridors
Thames River	29	Estuarine Subtidal	Fish and wildlife habitat Shoreline stabilization	Open water brackish wetlands
Route 2A Bypass	11	Palustrine Forested Scrub-Shrub/ Estuarine Intertidal	Fish and wildlife habitat Floodflow alteration/ Groundwater recharge Shore stabilization	Wetlands associated with Poquetanuck Cove are a CTDEP-designated significant natural community
Route 2 Bypass	13	Palustrine Forested	Fish and wildlife habitat Floodflow alteration Aesthetics	Most wetlands formed in natural depressions and swales

### 3.2.3 Wetland Impacts

Impacts on wetland resources by project element are shown in Table 3.2-2. A summary of the composite impacts for the No-Action alternative (Alternative A) and the five build alternatives (Alternatives B-F) is provided in Table 3.2-3. Impacts are illustrated in [Figure 3.2-2](#).

The planning concepts for all alternatives were developed to avoid impacts to wetlands, wherever feasible, and to minimize impacts by crossing wetlands at

locations where the wetland was narrow. Wetland impacts were also minimized by shifting alignments away from more sensitive wetland areas.

Direct effects to wetlands include the direct loss of wetland area as well as the loss of the principal valuable functions provided by those wetlands. For each alternative, wetland impacts have been evaluated with respect to the total amount of wetland filled, the type of wetland filled, and the functions that would be affected from the wetland filling. Indirect impacts to wetlands can occur when wetland hydrology is altered as a result of drainage modifications, and could result in changes in the extent of the wetland, its vegetation, wildlife habitat values, or the performance of wetland functions. These effects would be minor from alternatives that improve existing roadways. Other indirect effects would include the effects of edge creation, which could influence species composition, wetland fragmentation, and increased human disturbance. These effects would be expected from new alignment alternatives, which could also affect wildlife movement along riparian corridors. These indirect and secondary effects are evaluated qualitatively.

**Table 3.2-2**  
**Wetland Impacts by Project Element**

Project Element	Wetland Losses Hectares (Acres)					Total
	Palustrine Forested Wetland	Palustrine Emergent Marsh	Palustrine Scrub-Shrub	Open Water	Estuarine Subtidal Wetland	
Transitway	7.1 (17.5)	0.5 (1.1)	0.9 (2.1)	0.2 (0.4)	0	8.7 (21.5)
Busway	4.7 (11.6)	0.4 (1.0)	0.6 (1.5)	0.1 (0.2)	0	5.8 (14.3)
Rt 2A Bridge	0	0	0	0.1 (0.2)	0	0.1 (0.2)
Southern Transit Bridge	0	0	0	0.1 (0.3)	0	0.1 (0.3)
Northern Transit Bridge	0	0	0	0.2 (0.5)	0	0.2 (0.5)
NECR Passing Sidings	0	0	0	0	0.1 (0.2)	0.1 (0.2)
NECR Stations	0	0	0	0	0	0
Transitway Stations	0.3 (0.7)	0	0	0	0	0.3 (0.7)
Rt 32 Upgrade	<0.1 (<0.2)	0	0	0	0	<0.1 (<0.2)
Rt 164 Upgrade	<0.1 (<0.2)	<0.1 (<0.2)	<0.1 (<0.2)	0	0	<0.1 (<0.2)
Rt 2 Upgrade – Norwich	0	0	0	0	0	0
Rt 2 Upgrade – Rt 214 to I-95	0.1 (0.2)	<0.1 (<0.2)	0	0	0	0.2 (0.5)
Rt 2 Widening – Preston	0.6 (1.5)	0.0 (0.0)	0.1 (0.2)	0	0	0.7 (1.7)
Rt 2 Widening – Rt 214 to I-95	2.5 (6.2)	0.1 (0.2)	0.1 (0.2)	0	0	2.7 (6.7)
Rt 2A Bypass	1.1 (2.7)	0	0.1 (0.2)	0	0	1.2 (2.0)
Rt 2 Bypass	4.3 (10.6)	0	<0.1 (<0.2)	0.5 (1.2)	0	4.9 (12.1)

There would be no impacts on wetlands with the No Action alternative (Alternative A). Of the build alternatives, Alternative E would affect the least amount of wetlands (5.1 hectares [12.6 acres]). Most of these losses occur to forested wetlands along Route 2 from Route 214 to I-95 and the Route 2A Bypass. Impacts to wetlands along Route 2 are anticipated to be minor, as these areas are directly adjacent to an existing roadway and would already have reduced functional values. The Route 2A Bypass would affect wetlands associated with Halsey Brook and Crowley Brook. The bypass alignment was established to minimize impacts and to cross these riparian systems at narrow points. The key functions and values performed by these forested wetlands are wildlife habitat, flood storage, and groundwater recharge.

Alternative F affects 7.3 hectares (18.0 acres), primarily forested wetlands. The majority of these impacts occur along the Route 2 Bypass element (4.9 hectares [12.1 acres]). The alignment of the bypass was adjusted at several locations to avoid impacts to large complex wetland systems, particularly the large wetland west of North Anguilla Road, and wetlands

associated with Assekunk Brook north of Route 201. The majority of impacts are to slope wetlands or small isolated wetlands. The bypass alignment would cross the Lantern Hill Brook wetland, interrupting that riparian corridor. Construction of the Route 2A bridge widening would not affect vegetated wetlands, but would result in temporary impacts to river bottom and the permanent loss of 0.09 ha (0.22 ac) of open water wetland. Impacts due to Alternative D would be 8.1 hectares (19.9 acres), the least of the three mass transit alternatives (Alternatives B-D). The majority of these impacts are due to the busway element and mostly to forested wetlands. Alternatives B, C and D would cross wetlands associated with the Pawcatuck River south of White Rock Road, the Shunock River south of Route 184, and the Shunock River west of North Stonington village. The loss of wetlands along the Shunock River corridor would be the most substantial impact along the busway or transitway corridor, affecting a wide riparian wetland containing a complex of wetland communities.

Impacts of the rail transit Alternatives B and C would be similar (9.3 hectares [23.0 acres]) for Alternative B, and 9.5 ha (23.5 ac) for Alternative C with the north bridge), and represents the largest impacts of any of the five build alternatives. The largest wetland losses are due to the transitway element and occur to forested wetlands. The transitway would also affect wetlands associated with Shewville Brook, and would cross this riparian system in 3 locations. Although the former trolley line followed this alignment, development of the transitway would require reconstructing bridges, grade modifications, and widening the embankment in these locations. The monorail option would have slightly fewer wetland impacts, since the majority of the system would be constructed on an elevated structure. A surface service road would be built to allow maintenance and emergency access along the monorail, and would affect wetland resources.

**Table 3.2-3  
Wetland Impacts**

Alternative	Wetland Losses Hectares (Acres)					Total
	Palustrine Forested Wetland	Palustrine Emergent Marsh	Palustrine Scrub-Shrub	Open Water	Estuarine Subtidal Wetland	
A	No effects.					
B	7.5 (18.5)	0.6 (1.5)	0.9 (2.2)	0.2 (0.5)	0.1 (0.2)	9.3 (23.0)
C	7.5 (18.5)	0.6 (1.5)	0.9 (2.2)	0.4 (1.0)	0.1 (0.2)	9.5 (23.5)
D	5.1 (12.6)	0.5 (1.2)	0.6 (1.5)	0.1 (0.2)	0	6.3 (15.6)
E	4.4 (10.9)	0.2 (0.5)	0.4 (1.0)	0.1 (0.2)	0	5.1 (12.6)
F	6.2 (15.3)	< 0.1 (<0.2)	0.4 (1.0)	0.6 (1.4)	0	7.3 (18.0)

---

### **3.2.4 Wetland Mitigation**

A sequential approach to wetland mitigation has been followed during the planning phase of this project. Wetland impacts have been reduced with the selection of alternative corridors and centerlines that avoid to the greatest extent practicable the majority of wetlands.. Impacts will be further reduced for the preferred alternative through modifications to the layout and the incorporation of special design features such as steep side slopes, retaining walls or bridges. Where wetland impacts can not be completely avoided or minimized, compensatory mitigation will be proposed. Possible compensation includes wetland restoration, enhancement, and creation as well as possible preservation (purchase) of particularly valuable existing wetlands and surrounding habitats. A conceptual mitigation plan will be developed in conjunction with the regulatory agencies once a preferred alternative is identified.

---

## **3.3 Surface Water and Groundwater Resources**

The purpose of this section is to summarize the location of ponds, lakes, streams and rivers, community and non-community wells, aquifer protection areas, potential well fields, and groundwater resources within the study area. This section also summarizes the project impacts to surface water and groundwater in the study area and potential mitigation measures. The *Water Resources Technical Report* (Available for review at Town Halls and public libraries within the study area, and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation.

---

### **3.3.1 Methodology**

Connecticut State Health Department mapping, town-level zoning maps, and CTDEP GIS digital data layers were used to identify surface water and groundwater resources. CTDEP mapping was reviewed to inventory surface and groundwater classifications within the study area. United States Geological Survey water resources data and information were also reviewed and incorporated into this section.

---

### **3.3.2 Existing Surface and Groundwater Resources**

Surface waters within the Route 2 study area provide fish and wildlife habitat and recreational opportunities, as well as serve as receiving waters for

industrial discharges and stormwater runoff. Surface waters provide groundwater recharge to aquifers that provide public drinking water supplies. Groundwater availability within the study area varies with location and is a function of the local geology, topography, and land use.

#### **3.3.2.1 Surface Water Resources and Classifications**

Existing surface waterbodies and watercourses, their location within the study area, and their Use Classifications are summarized in Table 3.3-2.

#### **3.3.2.2 Groundwater Resources**

There are two sizeable stratified drift aquifers in the study area as described in the following paragraphs and shown on [Figure 3.3-2](#).

##### **Pawcatuck Sole Source Aquifer**

The Environmental Protection Agency (EPA) designation of a “sole or principal source aquifer” means that the aquifer supplies 50 percent or more of the drinking water for an area and for which there are no reasonable available alternative sources if the aquifer became contaminated. EPA designated the Pawcatuck River Aquifer System as a sole source aquifer in May 1988, and included all land within the Pawcatuck River watershed. The watershed occupies 480 square kilometers (300 square miles) in southwestern Rhode Island and southeastern Connecticut. Sections of North Stonington and Stonington within the watersheds of the Pawcatuck River, the Shunock River, and the Green Fall River lie within the Pawcatuck River watershed and sole source aquifer ([Figure 3.3-2](#)). Sole Source Aquifers (SSA) are afforded a high level of protection, and require EPA review of any federal project within the SSA limits. Within the study area, the Pawcatuck Sole Source Aquifer provides the only drinking water supply for the Town of Westerly, portions of the Town of Stonington, and the Town of North Stonington, and serves approximately 95,000 people throughout the SSA. Within the watershed limits of the SSA, there are two localized stratified drift aquifers that support the public drinking water supplies. These are located in the Shunock River corridor in North Stonington and in Stonington and Westerly adjacent to the Pawcatuck River. Groundwater recharge for these aquifers is dependent on surface water flows and runoff from the adjacent watersheds.

##### **Anguilla Brook Aquifer**

The Anguilla Brook aquifer is in the Towns of Stonington and North Stonington, immediately west of the Pawcatuck SSA ([Figure 3.3-2](#)).

The aquifer is centered over Anguilla Brook and extends south from Route 184 south through Stonington. The Anguilla Brook Aquifer is a stratified drift aquifer that provides the only major groundwater resource other than the Pawcatuck SSA, and is a potentially important public water supply for Stonington and North Stonington.

**Table 3.3-1**  
**Route 2 Study Area Surface Water Bodies and Use Classification**

Water Body	Municipality	Corridor	Use Classification
Lake Nova	Ledyard	Route 2, Transitway	A
Thames River	Montville	Thames River	SC/SB
Mohegan Brook	Montville	Route 32	A
Johnson Pond	Montville	Route 32	C/Bc
Oxoboxo Brook	Montville	Route 32	C/Bc
Picker Pond	Montville	Route 32	A
Shunock River	North Stonington	Transitway, Route 2	A
Anguilla Brook	North Stonington	Route 2 Bypass, Transitway	A
Lantern Hill Brook	North Stonington	Route 2, Transitway, Route 2 Bypass	A
Hill Brook Pond	North Stonington	Route 2 Bypass, Transitway	A
Stanley Pond	North Stonington	Route 2, Transitway	A
Phelps Brook	North Stonington	Transitway, Route 2	A
Hewitt Pond	North Stonington	Route 2	A
Gallup Pond	North Stonington	Route 2, Transitway	A
Lewis Pond	North Stonington	Route 2	A
Shunock Brook	North Stonington	Transitway	A
Assekonk Pond	North Stonington	Route 2	A
Assekonk Brook	North Stonington	Route 2 Bypass	A
Shetucket River	Norwich	Transitway, Route 2	SC/SB
Crowley Brook	Preston	Route 2	B/A
Hallville Pond	Preston	Transitway	B/A
Straight pond	Preston	Transitway	B/A
Gay Pond	Preston	Transitway	B/A
Geer Brook	Preston	Route 2	A
Myers Brook	Preston	Route 2	A
Hewitt Brook	Preston	Route 2	A
Shewville Brook	Preston	Transitway, Route 2	B/AA
Lucky Pond	Preston	Route 2	A
Amos Lake	Preston	Route 164	A
Avery Pond	Preston	Route 164	A
Lambert's Pond	Preston	Route 164	A
Hollowell Road Pond	Preston	Route 164	A
Indiantown Brook	Preston	Route 2, Transitway	AA
Halsey Brook	Preston	Route 2A Bypass	A
Hall's Brook	Preston	Route 2A Bypass	A
Dickermans Brook	Preston	Route 2A Bypass	A
Poquetanuck Cove	Preston, Ledyard	Route 2A, Transitway	SC/SB
Pawcatuck River	Stonington, Westerly	Transitway	C/B

A = potential drinking water supply; fish and wildlife habitat; recreational use; agriculture: industrial supply

B/A = waterbody currently does not meet water quality criteria for one or more Class A designated uses

B = recreational, fish and wildlife habitat, agricultural: industrial uses

Bc = known or presumed to meet Class B criteria, and supports a cold water fishery

C = water quality does not meet criteria for one or more Class B uses

SB = marine fish and wildlife; recreation; industrial uses

SC = wildlife habitat; recreation: industrial uses (does not meet all Class B criteria)

### **GAA Groundwater Areas**

Three areas within the study area are mapped as GAA groundwater resources (Figure 3.3-2), indicating that these are used as, or are potentially suitable for drinking water supply. These areas occur in Preston (a potential groundwater supply for Groton), North Stonington, and Stonington. The Stonington and North Stonington areas support the Southern Connecticut Water Authority (SCWA) North Stonington wellfield and the Westerly RI wellfield.

#### **3.3.2.3 Groundwater Supply**

Groundwater resources provide the majority of public and private drinking water supplies within the study area. Several portions of the study area rely on drinking water sources that are not within the study area the City of Norwich, the City of New London and the majority of the Towns of Waterford and Montville.

Groundwater supply, either from public (community) wellfields or individual non-community or residential wells, is critical to much of the study area. With the exception of the areas served by the community and non-community wells described below, all other residents of the study area rely on individual residential wells.

#### **Community Water Systems**

The Connecticut Public Health Code defines a Community Water System as a public water system that serves at least 25 residents throughout the year. Community water systems are comprised of one or multiple wells or reservoirs. Community water systems within the study area corridors that rely on wells potentially affected by the project include the Westerly Water Department, Preston Plains Water Company, Lincoln Park Senior Citizens Center, Mashantucket Pequot Water System, SCWA Mohegan Division, Cedar Ridge (North Stonington), and the SCWA North Stonington Division.

#### **Non-Community Wells**

The Connecticut Public Health Code defines a Non-Community (transient) Water System as a public water system that serves at least 25 persons at least 60 days out of the year and is not a community or a seasonal water system. Non-Community Water Systems within the study area include many of the commercial facilities within areas not served by public water companies. Fisher Controls and the North Stonington Professional Center are both supplied their water by non-community wells. Also included are restaurants along Route 2 in North Stonington and at the intersection of Route 2A and

Route 2 in Preston, and a restaurant on Route 2 in Preston. Future (approved) hotel developments on Route 2 in North Stonington will also have their own non-community wells. Several non-community wells also occur along Route 32 in Montville.

### **Potential Well Fields**

The Connecticut Public Health Code defines “potential well fields” as future sources of supply in the water supply plan of the public water supply system. The Town of Westerly, Rhode Island, is considering a future well in North Stonington, within the stratified drift aquifer associated with the Shunock River south of Route 184 and east of Route 2. The Town of Montville is also considering a potential well field at an unspecified location east of Route 32. Although no specific potential well fields have been identified, the Town of Stonington believes that public wells could be constructed in the Anguilla Brook aquifer in the future.

---

### **3.3.3 Surface and Groundwater Impacts**

Potential long-term impacts to surface water and groundwater quality from upgraded or new roadways can arise from an increase in stormwater runoff volumes, pollutant loadings and deicing chemicals, and from a decrease in pollution attenuation capabilities of wetlands. An increase in impervious surface area may also affect groundwater recharge. These issues are described below, while potential mitigation measures are discussed in Section 3.3.4. Impacts were evaluated in the categories described below.

- Impacts to surface water quality were determined based on the number of new stormwater discharges to a surface water body (measured as the number of new crossings). Stormwater from new transportation facilities may discharge to wetlands at other locations: for purposes of evaluating impacts to water resources, only direct discharges to surface water bodies have been included in this section of the Draft EIS.
- Impacts to community wells or wellfields were determined based on the distance from the edge of right-of-way of each alternative to the community wellfield. Any new construction within the 152-meter (500-foot) wellhead protection zone may affect water quality or groundwater flow. New impacts are defined to occur where there are currently no public roads within the wellhead protection zone. Possible increased impacts are defined to occur where public roads exist within the wellhead protection zone.
- Impacts to non-community wells were determined based on the distance from the edge of right-of-way of each alternative to the well location. Any new construction within the 61-meter (200-foot) sanitary radius of a non-

community well may affect water quality or groundwater flow. Possible increased impacts are defined to occur where public roads currently exist within the sanitary protection zone.

- Impacts to groundwater quantity (recharge) were determined based on the amount of new impervious surface (pavement) within the aquifer limits that would result from each alternative
- Impacts to surface and groundwater quality were also evaluated based on the changes in traffic volumes, since vehicular numbers are correlated with contaminant levels.

Increased impervious surface area increases the volume of stormwater runoff. This stormwater runoff increase has the potential to increase erosion of streambanks, increase the sedimentation of streams and downstream water bodies, and affect water resources by altering drainage patterns. The increase in runoff volumes also potentially affects wetlands and water bodies by decreasing their ability to attenuate pollutants carried within the stormwater runoff. Additionally, increases in stormwater runoff will increase the amount of pollutants carried to the receiving waters or wetlands.

Stormwater runoff from roadways can contribute metals, hydrocarbons, salts, sediments, and other substances to surface waters and groundwaters. The accumulation of pollutants from vehicles on roadway surfaces is primarily dependent upon vehicle traffic volumes. During storm events, the substances that have accumulated on the roadways are carried in runoff into the drainage system and into receiving waters.

The pollutants carried in highway runoff may have adverse effects on the aquatic ecosystem if they occur within surface waters in sufficient concentrations. According to a report titled *Effects of Highway Runoff on Receiving Waters* (FHWA/RD-84/062-066, June 1987), pollutants generated by traffic volumes under 30,000 vehicles per day exert minimal to no effect on the aquatic components of most surface waters and groundwaters, although the size of the watershed relative to the amount of stormwater discharge is also an important factor in assessing impacts. In general, annual pollutant loads from highways are low relative to the pollutant loads in entire watersheds.

Precipitation that cannot infiltrate a paved roadway surface will evaporate from the surface or drain to the side of the road, where it enters the soil and contributes to groundwater recharge. Net groundwater recharge volumes are therefore not expected to change substantially. Contaminants discharged with runoff from roadways have the potential to infiltrate groundwater and impact groundwater quality. Within sensitive areas a stormwater management system would be designed to direct flows out of the area, or to trap and retain potential contaminants prior to infiltration.

Rock cuts, blasting, and similar construction activities could alter localized groundwater flow. Such alteration of groundwater flow could potentially affect water levels or withdrawal rates in nearby wells.

Potential impacts to surface and groundwater resources by project element are shown in Table 3.3-2, and illustrated in [Figure 3.3-1](#). A summary of the composite impacts for the No Action alternative (Alternative A) and the five build alternatives (Alternatives B-F) is provided in Table 3.3-3.

Impacts are summarized in 3 categories: potential impacts to important groundwater resources (the Pawcatuck SSA) due to increased impervious surface and pollutant loading; potential impacts to surface water quality due to increased pollutant loading; and potential impacts to community and non-community wells.

**Table 3.3-2**  
**Water Resources Impacts by Project Element**

Project Element	Increased Contaminant Loading*	Impervious Area Increase: Pawcatuck Sole Source Aquifer	New Discharge to Surface Water Bodies	Community Wells within 152 m	Non- Community Wells within 60 m
Transitway	Negligible	5 ha (12 ac)*	27	2	4
Busway	Negligible	31 ha (77 ac)	15	1	3
Rt 2A Bridge	Negligible	0	0	0	0
Southern Transit Bridge	Negligible	0	0	0	0
Northern Transit Bridge	Negligible	0	0	0	0
NEC Stations	Negligible	0	0	0	0
Transitway Stations	Negligible	1.6 ha (3.9 ac)	0	0	0
Rt 32 Upgrade	Negligible	0	0	3	16
Rt 164 Upgrade	Negligible	0	0	0	2
Rt 2 Upgrade – Norwich	Negligible	0	0	0	0
Rt 2 Upgrade – Rt 214 to I-95	Volumes for Alternatives A, B-D exceed 30,000	4.2 ha (10.5 ac)	0	0	16
Rt 2 Widening – Preston	Volumes would exceed 30,000	0	0	0	4
Rt 2 Widening – Rt 214 to I-95	Volumes would exceed 30,000	22 ha (54.6 ac)	0	0	16
Rt 2A Bypass	Moderate	0	5	0	2
Rt 2 Bypass	Moderate	23.4 ha (57.8 ac) [Also 14.9 ha (36.8 ac) of Anguilla Brook Aquifer]	4	0	0

3 All private wells associated with residences adjacent to existing roads.

\* Impervious surface increase results if element constructed with paved service road.

Alternative A, although not including any construction, would have surface and potentially groundwater impacts. Traffic volumes along Route 2 in North Stonington would increase from 22,000 to 35,000 under this alternative, and would increase the discharge of contaminants to surface or groundwater resources, potentially affecting 18 non-community and 1 community well, and the Shunock River system that overlies a portion of the Pawcatuck SSA. Traffic volumes along all other study area roadways (Routes 2, 32, 164) would increase, but would remain below 30,000.

Alternatives B and C would not be expected to have a substantial effect on surface or groundwater resources. Neither the light rail nor the monorail systems would create new impervious surfaces, nor would they generate substantial pollutant loadings due to operations. Heavy and light rail vehicles do have the potential to generate oil and hydrocarbon contaminants from drippings, but these are largely contained by adsorption to the ballast. The upgrade of Route 2 in North Stonington would incorporate improvements to the roadway drainage system that would mitigate for increased contaminant loading due to higher traffic volumes.

In comparison, Alternative D would have greater potential effects due to the impervious surface required for the 2-lane system, but would generate substantially fewer pollutants than a typical vehicular roadway. The Busway could be designed with appropriate best management practices (BMPs) in sensitive areas to protect surface or groundwater quality. The upgrade of Route 2 in North Stonington would incorporate improvements to the roadway drainage system that would mitigate for increased contaminant loading due to higher traffic volumes.

Construction of the Route 2A Bypass as part of either Alternative E or F would not affect the Pawcatuck SSA or other mapped GAA resources. It would create new stormwater discharges and increase pollutant loadings to several streams, although traffic volumes along the new road would be less than the FHWA 30,000 vpd threshold. The Route 2A Bypass would substantially decrease traffic volumes on Route 2A, decreasing contaminant loading to Poquetanuck Cove. The upgrade of Routes 32 and 164 would not create new impacts to surface or groundwater resources, and would allow stormwater management and treatment BMPs to be installed to improve water quality. Traffic volumes on Route 2 in Preston and North Stonington would increase to levels above 30,000 vpd, and would increase contaminant loading to surface and groundwater resources. Alternative F would result in the creation of new impervious surface within the Pawcatuck SSA and the Anguilla Aquifer, although the areas are negligible in comparison to the size of the watersheds. The Route 2 Bypass would result in new discharges of stormwater runoff and pollutant loading to several streams, with traffic volumes approaching the 30,000 vpd threshold. This alternative would result

in improved water quality to the Shunock River and Pawcatuck SSA due to the decrease in traffic volumes (from 35,000 to 11,000 vpd).

Use of appropriate BMPs during construction (see Section 3.18.2) and incorporation of advanced stormwater management systems in project design, would mitigate potential impacts associated with the five build alternatives.

**Table 3.3-3  
Summary of Water Resources Impacts**

Alternative	Impervious Area Increase: Pawcatuck Sole Source Aquifer	New /Increased Discharges to Surface Water Bodies	Community Wells Within 152 m	Non-community Wells Within 60 m	New or Increased Effects due to Traffic Volumes
A	No increase.	8	4	35	Increased impacts along the Route 2 corridor
B	10.8 ha (26.4 ac)	27	2	20	Increased impacts along the Route 2 corridor
C	10.8 ha (26.4 ac)	27	2	20	Increased impacts along the Route 2 corridor
D	36.8 ha (91.4 ac)	15	1	19	Increased impacts along the Route 2 corridor
E	22 ha (54.6 ac)	5	3	40	Increased impacts along the Route 2 corridor and the bypass
F	23.4 ha (57.8 ac) [Also 14.9 ha (36.8 ac) of Anguilla Brook Aquifer]	9	3	24	Increased impacts along the bypasses: improvements on other roads

\* Impervious surface increase results if element constructed with paved service road.

### 3.3.4 Surface and Groundwater Mitigation Measures

Mitigation for potential long-term impacts to surface and groundwater resources will be accomplished by the incorporation of a number of

Stormwater BMPs into the selected alternative's final design. The project's Stormwater Management System will be designed to avoid or minimize water quality and quantity impacts that could be caused by the construction of new, widened, or upgraded roadways or transitways. In some cases, the objective will be to improve water quality in the project area.

This project will comply with the Connecticut Antidegradation Implementation Policy (CTDEP 1992). The policy requires the maintenance and protection of water quality in high quality waters.

Stormwater management systems mitigate for potential impacts to water quality by controlling runoff velocities and removing roadway pollutants from the stormwater runoff before they discharge to downstream surface water resources. The project will generally employ open drainage systems (water flows from the pavement surface overland through swales or flat areas), however, in order to direct runoff away from sensitive areas, such as wellhead protection areas, closed drainage systems (water is collected in catchbasins and directed to discharge points in pipe systems) may be employed.

Drainage systems will incorporate features which will partially treat and runoff. These design features include grassed swales and buffer strips, sediment traps, and, where necessary, closed storm drains to pipe runoff past sensitive areas.

Wherever possible and appropriate, vegetated (e.g., grassy) buffer strips and swales and other landscaped areas will be used to collect and direct runoff. Vegetated buffers and channels reduce pollutants by promoting sedimentation and by creating conditions that absorb, trap, and degrade contaminants.

The primary contribution to water filtration and purification provided by a closed drainage system is sediment reduction and isolation of floatables as a result of catch basin designs. Catch basins can limit the direct release of oil and grease and other floatables into the stream flow of the drainage system. In addition, the sump in each catch basin serves to collect sediments. At selected discharge points within highly sensitive areas that could receive large amounts of roadway runoff, gross particle separators may be proposed to treat the "first flush" of the storm.

ConnDOT uses calibrated sanding equipment along with operating personnel trained in established procedures to reduce salt use to a minimum on all state-maintained roads. To protect drinking water supplies, the Department of Public Health can recommend areas in which no or reduced deicing salt is to be used.

Hazardous material spills of a magnitude that could substantially affect the environment are not anticipated to occur on new or improved roadways within sensitive groundwater areas, due to the improved roadway geometry and safety features that will reduce the likelihood of accidents. There is a low

usage of Route 2 by commercial vehicles carrying hazardous materials, since the roadway does not provide direct access to industrial facilities requiring or producing hazardous or contaminated materials. Modern highway design substantially reduces safety problems as opposed to older, existing roadway networks. Where there is a closed drainage system, spill containment systems could be designed to mitigate for the catastrophic consequences of a hazardous material spill on the roadway, within the recharge areas of stratified drift aquifers or community wellfields.

---

### **3.4 Floodplains**

Floodplains are low lying areas that are adjacent to streams, rivers, or coastline. These areas store water during periods of flooding. Flood storage capacity provided by a floodplain reduces flooding impact on land downstream by reducing peak flows. This section summarizes the existing floodplains in the study area, project impacts to floodplains, and mitigation measures. The *Floodplain Technical Report* (Available for review at Town Halls and public libraries within the study area, and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation.

---

#### **3.4.1 Methodology**

Floodplains were determined from the 100-year floodplain from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for the study area. Elevations for 100-year floodplains in those corridors were obtained, when available, from the FIRM for each town in the study area.

---

#### **3.4.2 Existing Conditions**

The following sections discuss existing floodplains and Connecticut's Stream Channel Encroachment Line program (SCEL).

##### **3.4.2.1 Existing Floodplains**

Mapped floodplains within the study area are associated with the following water bodies: Assekunk Brook, Dickerman Brook, Hewitt Brook, Horton Cove, Indiantown Brook, Oxoboxo Brook, Picker Pond, Pawcatuck River, Poquetanuck Cove, Shetucket River, Shewville Brook, Shunock River, Spaulding Pond Brook, Stony Brook, and the Thames River.

#### **3.4.2.2 Connecticut Stream Channel Encroachment Line Program**

CTDEP requires filing a Stream Channel Encroachment Line Permit Application for selected flood prone areas. This permit is required for proposed placement of an encroachment or obstruction riverward of the stream channel encroachment lines. CTDEP has listed segments of the Shetucket River, between Norwich Harbor and the Greenville Dam, in the SCEL.

---

#### **3.4.3 Floodplain Impacts**

Impacts on floodplains were estimated by overlaying the right-of-way limits (operationally defined as the project's edge of disturbance) on the FEMA mapped 100-year floodplains. Impacts by project element are shown in Table 3.4-1. A summary of the composite impacts for the No Action alternative (Alternative A) and the five build alternatives (Alternatives B-F) is provided in Table 3.4-2. [Figure 3.2-2](#) illustrates the impact of each alternative on floodplains.

**Table 3.4-1  
Floodplain Impacts by Project Element**

<b>Project Element</b>	<b>Number of Stream/River Crossings <sup>1</sup></b>	<b>Area of 100-year Floodplain in ROW Hectares (Acres)</b>
Transitway	20	8.2 (20.1)
Busway	15	4.0 (9.8)
Rt 2A Bridge	1	N/A
Southern Transit Bridge	1	N/A
Northern Transit Bridge	1	N/A
NEC Stations	0	Minimal
Transitway Stations	0	Minimal
Rt 32 Upgrade	2	< 0.1 (0.1)
Rt 164 Upgrade	0	0
Rt 2 Upgrade – Norwich	0	0
Rt 2 Upgrade – Rt 214 to I-95	3	0.1 (0.2)
Rt 2 Widening – Preston	2	0.2 (0.4)
Rt 2 Widening – Rt 214 to I-95	3	0.7 (1.8)
Rt 2A Bypass	3	1.1 (2.7) )
Rt 2 Bypass	2	1.2 (3.1)

<sup>1</sup> Only waterways with mapped 100-year floodplains were considered.

Alternative A (No Action) would have no impact on floodplains since there would be no construction associated with this option. Of the remaining alternatives, Alternative E would have the smallest floodplain impact since it has the least amount of new alignment. Floodplain impacts could include the Thames River, Poquetanuck Cove, Dickerman's Brook, Hewitt Brook, Shewville Brook, and Indiantown Brook . Alternative F impacts approximately 0.5 hectares (1.2 acres) more floodplain than Alternative E due to the greater impact of the Route 2 Bypass as compared to widening Route 2 between Route 214 and I-95.

Alternatives B, and C would result in the greatest impacts to floodplains. Busway Alternative D, would impact approximately 4.2 hectares (10.4 acres) less of floodplain than transitway Alternatives B or C. Since Alternative B does not require a rail bridge with associated piers in the Thames River, its impact on floodplains would be slightly less than Alternative C.

**Table 3.4-2**  
**Summary of Floodplain Impacts**

Alternative	Impacts
A	No new impacts
B	8.3 ha (20.5 ac)
C	8.3 ha (20.5 ac) plus bridge piers in Thames River.
D	4.1 ha (10.1 ac).
E	2.0 ha (4.9 ac) plus new bridge piers in Thames River.
F	2.5 ha (6.2 ac) plus new bridge piers in Thames River.

Additional details of the impact analysis are available in the *Floodplains Technical Memorandum*.

---

#### **3.4.4 Floodplain Mitigation Measures**

Floodplain mitigation for this project includes both avoidance and minimization. Bridges are the primary means of avoiding encroachment, while retaining walls and similar structures will be incorporated as project design is refined. Once a preferred alternative is identified and its preliminary design completed, floodplain impacts will be quantified on a volume basis and compensatory flood storage areas will be evaluated consistent with Executive Order 11988, *Floodplain Management*, and 23 CFR 650, Subpart A, and the Connecticut Floodplain Management regulations.

---

### **3.5 Biodiversity**

Biological diversity, or biodiversity is an assessment of the numbers, types, and relative abundance of plant and animal species and natural communities. This section discusses biodiversity and vegetation, both regionally and within the study area. It also describes fisheries and wildlife in the study area. In addition, this section summarizes project impacts to biodiversity in the study

area and mitigation measures. The *Biodiversity Technical Report* (available for review at Town Halls and public libraries within the study area, and at ConnDOT) contains additional details.

---

### 3.5.1 Methodology

Cover types were mapped based on aerial photography of the study area. Information on regional vegetation and fisheries and wildlife species in the study area was gathered from CTDEP published resources, species atlases, and other available literature. The information on study area vegetation was collected during field reconnaissance. Cover types and biological resources were not mapped along Route 32, 164, or upgraded portions of Route 2, as any work would be adjacent to the existing roadway and would have a negligible effect on biological diversity.

---

### 3.5.2 Existing Biodiversity

This section summarizes vegetation diversity regionally and within the study area. The chapter also discusses fisheries and wildlife resources, terrestrial wildlife, important habitat blocks, and wildlife corridors.

#### 3.5.2.1 Study Area Vegetation

Eight cover types were identified and mapped in the study area (deciduous forest, coniferous forest, shrub, herbaceous, agricultural, unvegetated, developed, and open water). These vegetation types are present in a fragmented mosaic resulting from post-agricultural succession and current land uses. The majority of the study area is second-growth deciduous woodland typical of the southern New England. The deciduous forested areas are all generally similar within the study area, with an oak-dominated community regardless of topography. Smaller portions of the project area consist of coniferous-forested areas. These patches are often associated with larger patches of deciduous forest cover types. Three types of coniferous-forest occur in the study area: hemlock slopes, white pine stands, and Atlantic white cedar swamps.

The study area vegetation is typical of the central hardwoods-hemlock-white pine forest region of southeastern Connecticut and Rhode Island. Dominant trees in the central hardwoods-hemlock-white pine forest consist of American beech, hickories, yellow and black birch, and red, black, and white oaks. Red maples occur in wetter areas. Conifers in this region generally include white pine and hemlock.

Dense shrub communities occur along many of the streams and waterbodies in the study area. Some study area wetlands are shrub or sapling communities and have been mapped as shrub cover. Shrub communities are also seen where old fields are in the early stages of reverting to forests. Herbaceous cover types in the study area occur in old fields, roadsides, wet meadows, salt and freshwater marshes, and brackish intertidal marsh.

Several active farms are in the study area. Agricultural types include crops such as corn, and pasture for dairy cows. Some areas of pasture have been mapped as herbaceous cover, because grazing or cutting does not appear to have altered the natural habitat values. Areas in the unvegetated cover type include quarries, sandy portions of power line rights-of-way, and other areas devoid of vegetation. The open water cover type includes lakes, ponds and larger streams within the study area. Shallower portions of these water bodies often contain submerged aquatic vegetation and emergent species.

#### **3.5.2.2 Fisheries Resources**

Fisheries resources provide food resources for wildlife as well as recreational opportunities and food for both residents and tourists. Stocked waterbodies in the study area include Indiantown Brook in Preston and Ledyard, Anguilla Brook in Ledyard and Stonington, Lantern Hill Brook in North Stonington, Shunock Brook in North Stonington, the Yantic River in Norwich, the Shetucket River in Preston, and Long Pond in Ledyard. All water bodies within the study area corridors support native fish populations that include American eel, alewife, brook, brown, and rainbow trout in cold water streams and rivers, and warmwater fish communities including redbfin pickerel, dace, darters, suckers, large and smallmouth bass, sunfish, and perch in ponds, warm water streams, and wetlands.

#### **3.5.2.3 Terrestrial Wildlife**

The study area supports a variety of cover types that provide wildlife habitat.

Upland and wetland habitats are likely to support communities of reptiles and amphibians, including common snapping turtle, wood turtle, northern water snake, northern ringneck snake, eastern smooth green snake, eastern milk snake, eastern garter snake, redback salamander, northern two-lined salamander, marbled salamander, and spotted salamander. No areas that

may provide unique or important habitats for herptofauna were identified within the study area corridors, and no vernal pools were identified during field reconnaissance.

The varied cover types provide habitats for approximately 150 species of birds that are known or expected to occur in the study area during the breeding and/or wintering season. The deciduous forested areas provide habitat for the majority of these species, which primarily include birds that are “area insensitive” and do not require large areas of undisturbed habitat. Forty species of mammals are expected to occur within the study area, primarily within forested habitats.

#### **3.5.2.4 Important Wildlife Habitats**

Important wildlife habitats include large contiguous forested areas (“Forest blocks”), large grassland areas (“Grassland blocks”) and wildlife corridors. Forest blocks and riparian wildlife corridors are present within the study area (Figure 3.5-1)

Forest blocks are defined as those areas of contiguous forest having a minimum area of at least 100 hectares (250 acres) and a minimum diameter of 500 meters (1,500 feet). There are five forest blocks containing interior forest habitat that occur within the study area (Figure 3.5-2). All the forest blocks contain both coniferous and deciduous forest. Because of this interspersed cover types, the forest blocks provide interior forest habitat for species that prefer deciduous and coniferous forest communities.

Grassland blocks are defined as areas of contiguous upland with herbaceous or shrub cover larger than 100 hectares (250 acres) with minimum diameter of 500 meters (1,500 feet). None of the grasslands in the study area meet these minimum size criteria.

Wildlife corridors are defined as strips of undisturbed vegetation a minimum of 100 meters (300 feet) wide that connect forest blocks. Corridors are important to biodiversity preservation because they enable species to disperse between patches of suitable habitat, maintain large home ranges, exchange genes, and maintain regional population levels. No upland wildlife corridors are present within the study area that connect forest blocks. However, wildlife corridors are likely to exist along riparian systems that are bordered by undeveloped lands. Riparian corridors occur along portions of Assekunk Brook, Shewville Brook, and the Shunock River.

---

#### **3.5.3 Biodiversity Impacts**

Potential impacts on biodiversity were analyzed at both the species and community level. Impacts to fish and wildlife resources were primarily

assessed by examining potential effects on their habitats. Impacts to important habitat features such as forest blocks and travel corridors were also evaluated. Vegetation cover types are used as the principal indicators of effects on biodiversity, since plant community types provide food resources, shelter, nesting and migratory habitat, and are directly correlated with wildlife species distribution and abundance. Additional details of the impact analysis are available in the *Biodiversity Technical Memorandum*. [Figure 3.5-1](#) illustrates the impacts of each alternative on vegetation cover types.

Impacts on biodiversity can be categorized as either direct or indirect. Direct effects include direct losses or conversions of habitat due to project construction. Indirect effects include fragmentation of habitats; creation of detrimental edge effects; loss of genetic diversity with the isolation of small populations; increased competition for resources with reduced habitat availability; interference with animal movements; and detrimental effects of stormwater runoff on aquatic systems.

Direct impacts on wildlife resources were evaluated by overlaying the right-of-way limits (operationally defined as the edge of disturbance) on a vegetation cover type map for each study corridor. It was assumed that both an upgrade and widening of an existing highway segment could be accomplished largely within the existing right-of-way with minimal or no direct loss of wildlife habitat. Habitat impacts for those project elements involving corridor alignments on new location are shown in Table 3.5-1.

**Table 3.5-1**  
**Impacts to Vegetative Cover Types**

Project Element	Impacts (hectares/acres)						Total	
	Forested		Non-Forested			Open Water	Forested	Non- Forested
	Coniferous	Deciduous	Shrub	Herbaceous	Agricultural			
Transitway	4.2 (10.4)	26.9 (66.4)	2.1 (5.2)	6.5 (15.9)	2.0 (4.9)	0.9 (2.1)	31.1 (76.8)	11.4 (28.1)
Busway	1.8 (4.4)	14.7 (36.4)	1.0 (2.5)	5.3 (13.1)	0.7 (1.8)	0.7 (1.8)	16.5 (40.8)	7.7 (19.1)
Route 2A Bypass	4.1 (10.0)	8.0 (19.8)	1.1 (2.8)	1.1 (2.8)	0.2 (0.6)	0.004 (0.01)	12.1 (29.9)	2.5 (6.2)
Route 2 Bypass	2.5 (6.1)	37.4 (92.4)	1.1 (2.8)	2.5 (6.2)	1.1 (2.8)	0.4 (1.1)	39.9 (98.6)	5.1 (12.7)

Potential impacts on fishery resources were assumed to be directly related to the number of river and stream crossings associated with each project element. These impacts are largely related to the alteration of stream bottom

habitat resulting from placement or extension of culverts, as well as potential water quality degradation associated with highway runoff. Impacts to fisheries resources and communities of other aquatic wildlife (invertebrates, reptiles and amphibians) would be greater from a new stream crossing that would both result in habitat loss and potential water quality impacts, and would be minimal where an existing culvert would be extended.

A summary of the composite impacts for each of the alternatives is provided in Table 3.5-2. There would be no new impacts on biodiversity with the No-Action alternative (Alternative A).

Most wildlife tend to avoid roads and adjacent areas, and plant communities along roadsides tend to be disturbed. Therefore, direct and indirect effects on biodiversity are expected to be minimal along the project elements that would be constructed along existing roads (i.e., Route 32 Upgrade, Route 164 Upgrade, Route 2 Upgrades and Route 2 Widening), although roadway widening would result in minor losses of edge habitats.

New roadway or transitway alignment (i.e., the Route 2 Bypass, Route 2A Bypass, Transitway and Busway) will have the largest impacts on biodiversity primarily through the direct loss of deciduous forest habitat and creation of new edge habitat. However, deciduous forest is the most affected cover type under each of the elements, and is also the most common cover type in the area. Construction along new alignments may decrease habitat availability to area-sensitive or forest interior nesting birds, particularly if a new alignment would result in fragmentation of a large area of contiguous forest. Alternative F is expected to have the greatest adverse effect on biodiversity. Impacts to biodiversity will be most pronounced under this alternative because of the length of the Route 2 Bypass, because the alignment crosses through largely undeveloped areas including small portions of two forest blocks in Ledyard and North Stonington, and because it requires several new stream crossings.

Alternatives B and C incorporating the transitway element will have the second highest direct impact in terms of habitat loss, mostly because of the length of the transitway alignment. Where possible, the transitway follows existing or former rights-of-way. One forest block in Preston will be slightly affected under these alternatives but will continue to provide forest-interior habitat.

Alternative D incorporating the busway has the third highest total impact on wildlife habitat. Since the busway length is shorter than the transitway, this alternative has less impact than Alternatives B and C.

Alternative E incorporating the Route 2A Bypass (but not the Route 2 Bypass) will have the least impact on biodiversity of the five build alternatives, primarily because its section of new alignment is relatively short and does not affect any forest blocks in the area. In addition, fewer stream crossings would be constructed under this alternative reducing aquatic impacts.

**Table 3.5-2**  
**Summary of Biodiversity Impacts**

Alternative	Wildlife Impacts			Aquatic Impacts
	Forest	Non-Forest	Total Habitat Loss	New Stream Crossings
A	No new effects.			No new effects.
B	31.1 ha (76.8 ac)	11.4 ha (28.2 ac)	42.5 ha (105.0 ac)	21
C	31.1 ha (76.8 ac)	11.4 ha (28.2 ac)	42.5 ha (105.0 ac)	21
D	16.5 ha (40.8 ac)	7.7 ha (19.1 ac)	24.2 ha (59.9 ac)	15
E	12.1 ha (29.9 ac)	2.5 ha (6.2 ac)	14.6 ha (36.1 ac)	3
F	52.0 ha (128.5 ac)	7.6 ha (18.8 ac)	59.6 ha (147.4 ac)	5

### 3.5.4 Biodiversity Mitigation Measures

Ensuring that suitable travel corridors connect important habitat areas can mitigate the consequences of habitat fragmentation on wildlife. Specifically, bridging wetland areas and waterways allows wildlife movement to continue. Many species, including large and small mammals, reptiles and amphibians, will use areas under bridges to access breeding and feeding areas. Where culverts are used for stream crossings, open box structures are preferred to pipe culverts to facilitate wildlife passage. The use of open box culverts will also eliminate the loss of stream bottom substrates. Designing culvert inverts below the elevation of the stream bottom also ensures that these structures will not impede fish passage.

Seeding disturbed areas with native wildflower species after construction can enhance plant diversity. Quickly re-vegetating these areas also reduces the likelihood of invasion by nuisance or exotic species and reduces soil erosion. Changing maintenance practices such as lengthening the period between roadside mowings may also mitigate for long term impacts by enhancing

native plant communities and lessening the disturbance of wildlife species, such as song birds and small mammals, which use the roadside habitats.

Seasonal timing of construction so as to avoid critical breeding or spawning seasons can also minimize the potential for indirect effects on both wildlife and fisheries resources. Construction impacts to aquatic resources in general can be mitigated by the appropriate use of BMPs for erosion and sedimentation control (see Section 3.18.2).

---

## 3.6 Rare Species

This section discusses existing federal endangered and threatened species; state endangered, threatened, and species of special concern, and state-designated significant natural communities. It also summarizes the rare species impacts in the study area from the project and potential rare species mitigation measures. The *Rare Species Technical Report* (available for review at Town Halls and public libraries within the study area and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures.

---

### 3.6.1 Methodology

Rare and Endangered species information was obtained from the USFWS, the Connecticut Natural Resources Center, and the Rhode Island Natural Heritage Program. Each of these agencies compiled information based on the limits of the study area and their current databases of rare and endangered species.

---

### 3.6.2 Existing Rare Species

This section discusses species listed under the Federal Endangered Species Act, the Connecticut Endangered and Threatened Species Act that are known to occur within the study area. There are no species listed in the Rhode Island Endangered Species Act, or state exemplary natural community types, known to occur within the study area.

This section also discusses CTDEP-designated Significant Natural Communities. These areas are nonregulatory, but contain ecologically sensitive communities with uncommon populations of species. Significant Natural Communities are shown on [Figure 3.5-1](#).

### 3.6.2.1 Federal Species

The USFWS has indicated that there are no federally listed endangered or threatened species known to occur within the study area.

### 3.6.2.2 Connecticut Species

There are 3 Connecticut endangered species, 1 Connecticut threatened species, and 5 species of special concern in the project area. Portions of three corridors contain areas of Connecticut Significant Natural Communities and a Wintering Duck Concentration Area. The complete list of species and communities as obtained from the CTDEP for the general project area is provided in Table 3.6-1.

**Table 3.6-1**  
**Summary of State of Connecticut Listed Species and Communities in the Project Area**

Species Name / Community Type	Common Name	Listing Category
<i>Acipenser oxyrhynchus</i>	Atlantic sturgeon	CT Threatened
<i>Plantago virginica</i>	Virginia plantain	CT Special Concern
<i>Limosella subulata</i>	Atlantic mudwort	CT Special Concern
<i>Lilaeopsis chinensis</i>	Eastern lilaeopsis	CT Special Concern
<i>Scirpus paludosus</i> var. <i>atlanticus</i>	Bayonet grass	CT Special Concern
<i>Aster prenanthoides</i>	Crooked-stemmed aster	CT Special Concern
<i>Ranunculus cymbalaria</i>	seaside crowfoot	CT Endangered
<i>Eleocharis quadrangulata</i>	four-sided spike rush	CT Endangered (thought to be planted at this location)
Mamacoke Marsh	Salt Marsh	Significant. Natural Community
Smith Cove	Wintering duck concentration area	Significant Natural Community
Poquetanuck Cove	Brackish Intertidal Marsh	Significant Natural Community
Ledyard Cedar Swamp	Atlantic White Cedar Swamp	Significant Natural Community

### 3.6.3 Rare Species Impacts

None of the alternatives evaluated in this Draft EIS will have a direct impact on known significant natural communities or known localities of state-listed rare species, as avoidance of sensitive species and important natural communities was a concern during the development of project concepts. The *Rare Species Technical Report* provides a more detailed analysis. [Figure 3.5-1](#) illustrates the impacts of each alternative on significant natural communities. Locations of known rare species are not provided in this Draft EIS, in order to protect sensitive species.

Alternatives C, E and F may affect Atlantic sturgeon habitat in the Thames River through the construction of new bridges and placement of new bridge piers. Since the loss of habitat due the placement of piers would be relatively small, no long-term impact on the sturgeon population is anticipated. Bridge construction could result in short-term adverse effects due to temporary habitat disruption or increased turbidity from construction and excavation of river substrates.

Reconstruction of the NECR will not occur within tidal wetlands, and will not affect listed plant species along the Thames River. The increased train traffic along this line will not affect the ability of Smith Cove to provide overwintering habitat for migratory waterfowl.

---

#### **3.6.4 Rare Species Mitigation Measures**

Since no direct impact to known locations of rare species or Significant Natural Communities is anticipated, no specific mitigation measures are proposed. Continued avoidance of known locations will be prioritized in final design, with design features and construction practices incorporated to minimize the potential for indirect effects (e.g., incorporation of BMPs for control of erosion and sedimentation).

---

### **3.7 Agricultural Soils**

The Federal Farmland Protection Policy Act (FPPA) of 1981 was enacted to ensure that significant agricultural lands are protected from conversion to non-agricultural uses. The FPPA regulates four types of farmland soils: prime farmland, unique farmland, farmland of statewide importance, and farmland of local importance.

The State of Connecticut also has a Purchase and Development Rights Program to preserve agricultural land (The 422a Program). This program allows the state to purchase the development rights of agricultural land based on cost, suitability, and likelihood of conversion to non-agricultural purposes. Once the development rights of agricultural land are purchased by the state, the land may not be released from its restrictions unless the owner and town petition for its removal and hold a town referendum. If the majority of voters in the referendum vote in favor of the petition, the current landowner must pay the Connecticut Commissioner of Agriculture for the development rights and the costs of the petition process.

This section discusses existing farmlands within the study area, describes the project impacts to farmland, and discusses potential mitigation measures. The *Farmland Technical Report* (available for review at Town Halls and public

libraries within the study area and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures.

---

### **3.7.1 Methodology**

Prime farmlands and farmlands of statewide importance were obtained from the MAGIC (Connecticut) and RIGIS (Rhode Island) web pages. These pages contain publicly accessible soil information in GIS digital format. Farmland held in the Connecticut's 422a Program was obtained from the state of Connecticut Department of Agricultural Farmland Preservation office. Mapped farmland soils (as shown on [Figure 3.7-1](#)) are not regulated where soils have been developed or are within an existing transportation right-of-way. Impacts to regulated farmland soils were calculated by excluding all developed and transportation areas. Impacts to active farms are discussed in the Land Use section of this Draft EIS (3.14).

---

### **3.7.2 Existing Conditions**

The following paragraphs discuss existing agricultural soils and Connecticut's 422a Program.

#### **3.7.2.1 Existing Agricultural Soils**

The United States Department of Agriculture Natural Resources Conservation Service identifies prime farmland soils based on the physical conditions of the soil unit. These physical conditions include water regime, slope, temperature, pH, drainage, salinity, erodibility, and texture. Additional farmland of statewide importance are lands that are important for production of crops and consist of soils that nearly qualify for prime farmland and produce similar yields under favorable conditions.

Prime farmland and farmland of statewide importance were the only regulated soil types found in the study corridors. No unique or local farmlands for this area were noted.

#### **3.7.2.2 The 422a Purchase and Development Rights Program**

One parcel in the study corridors is in the 422a Program. This property is south of Route 2 in Preston and Ledyard near the junction of Routes 2 and Route 164, and extends south to the former trolley alignment (currently

maintained as a Connecticut Light and Power right-of-way). This property contains Prime Farmland soils.

---

### 3.7.3 Agricultural Soils Impacts

Impacts to Agricultural Soils were estimated using GIS by overlaying the project right-of-way limits on maps showing regulated Farmland Soils. Developed areas, which are not covered by the Farmland Protection Policy Act (FPPA) of 1984, were excluded. Impacts by project element are shown in Table 3.7-1. A summary of the composite impacts for the No Action alternative (Alternative A) and five build alternatives (Alternatives B-F) is provided in Table 3.7-2. Additional details of the impact analysis are available in the *Farmland Soils Technical Memorandum*. Impacts to farmland soils are illustrated in [Figure 3.7-1](#).

Many of the project elements do not impact regulated Farmland Soils. These elements include: the Thames River Bridges, NECR stations, Route 32 and Route 164 Upgrades, and Route 2 Upgrades. These elements are associated with existing road and rail rights-of-way and do not require the expansion of the existing corridor into areas of regulated Farmland Soil. Alternative A (No Action) does not impact regulated Farmland Soils.

The five Build alternatives result in similar impacts to Farmland Soil. The difference in area of regulated Farmland Soil impact among Alternatives B-F is no greater than 7 hectares (17.3 acres). Alternatives B and C impact 27.3 hectares (67.5 acres) of Farmland Soil and have the largest area of impact. The least amount of Farmland Soil impact occurs with either the busway (Alternative D) or Alternative F; both impact approximately 20 hectares (50 acres). However, Alternative D impacts 2.5 hectares (6.3 acres) less of Prime Farmland than does Alternative F.

Once a preferred alternative is identified a Farmland Conversion Impact rating Form (AD-1006) will be prepared in cooperation with the Natural Resources Conservation Service (NRCS), if necessary. This form evaluates all the alternatives in a comparative fashion with regard to their farmland impacts as required by the FPPA. Connecticut Public Act 98-259 requires a statement from the Commissioner of Agriculture for any capital project that would convert 25 or more acres of prime farmland to a non-agricultural use. As shown in Table 3.7-2, each of the alternatives under consideration would affect more than 25 acres (10.1 hectares) of Prime Farmland, with the exception of Alternative D.

**Table 3.7-1**  
**Regulated Farmland Soil Impacts by Project Element**

Project Element	Total		Prime Farmland		Farmland of Statewide Importance	
	(hectares)	(acres)	(hectares)	(acres)	(hectares)	(acres)
Transitway	24.7	61.0	11.3	28.0	13.4	33.1
Busway	18.4	45.5	7.5	18.7	10.9	26.9
Rt 2A Bridge	0	0	0	0	0	0
Southern Transit Bridge	0	0	0	0	0	0
Northern Transit Bridge	0	0	0	0	0	0
NEC Stations	0	0	0	0	0	0
Transitway Stations	2.6	6.4	2.3	5.7	0.3	0.7
Busway Stations	1.6	3.9	1.3	3.2	0.3	0.7
Rt 32 Upgrade	0	0	0	0	0	0
Rt 164 Upgrade	0	0	0	0	0	0
Rt 2 Upgrade – Norwich	0	0	0	0	0	0
Rt 2 Upgrade – Rt 214 to I-95	0	0	0	0	0	0
Rt 2 Widening – Preston	0.63	1.55	0.43	1.06	0.20	0.49
Rt 2 Widening – Rt 214 to I-95	15.02	37.12	10.86	26.83	4.16	10.29
Rt 2A Bypass	8.76	21.62	2.70	6.66	6.06	14.96
Rt 2 Bypass	10.72	26.49	8.25	20.38	2.47	6.11

**Table 3.7-2**  
**Summary of Impacts to Regulated Farmland Soils**

Alternative	Regulated Farmland Soils		
	Prime	Hectares (Acres) Statewide	Total
A			
B	13.6 (33.6)	13.7 (33.9)	27.3 (67.5)
C	13.6 (33.6)	13.7 (33.9)	27.3 (67.5)
D	8.8 (21.9)	11.2 (27.6)	20.0 (49.5)
E	14.0 (34.6)	10.4 (25.7)	24.4 (60.3)
F	11.4 (28.1)	8.7 (21.5)	20.1 (49.6)

### **3.7.3.2 State of Connecticut 422a Program**

The Transitway alignment (Alternatives B and C) will pass through the one 422a farm parcel, along the southern edge of the property. None of the other alternatives has any effect on this parcel.

---

### **3.7.4 Mitigation Measures**

No mitigation other than avoidance and minimization is available for this resource since loss of important farmland soils and the productivity associated with them during construction is an irretrievable and irreversible commitment of resources. However, some salvaging of topsoils (loams) is usually practiced, which are then used for roadside dressing or other landscaped areas. The transitway alignment may require that a private grade crossing be created to allow access to farmed land south of the alignment, at the 422a property in Preston.

---

## **3.8 Historic Resources**

This section describes existing historic resources and potential impacts to those resources that may result from each of the alternatives under consideration. Historic resources include above-ground structures or properties that are listed in, or eligible for listing in, the National Register of Historic Places (NRHP). Criteria for eligibility are that a property have significance in American history, architecture, archaeology, engineering or culture, and that the property possess integrity of location, design, setting, materials, workmanship and association. Properties must also have been associated with a significant event, a significant person, embody the distinctive characteristics of a period, or are likely to yield information important in history.

Historic resources are regulated under Section 4(f) of the Transportation Act, and under Section 106 of the National Historic Preservation Act (16 U.S.C. 470f). Chapter 5 of this Draft EIS provides an analysis of impacts to historic resources in compliance with Section 4(f). The *Historic Resources Technical Report* (available for review at Town Halls and public libraries within the study area and at ConnDOT) provides additional information on historic resources within the study area.

---

### **3.8.1 Methodology**

A Historic Resources Survey was conducted within the study corridors to provide an inventory of all buildings, sites, structures, and objects greater

than 50 years old, and to evaluate their eligibility for listing in the NRHP. The investigation included background research using the files of the Connecticut Historical Commission (CHC) and the Rhode Island Historical Preservation and Heritage Commission (RIHPHC), the Connecticut State Archives, and local historical commissions. Field investigations and visual inspections were conducted throughout the study area. This study is documented in the *Historic Resources Technical Report*.

---

### 3.8.2 Existing Historic Resources

This survey identified 469 properties that were at least 50 years old, and evaluated these for potential eligibility. No properties less than 50 years old were identified that possessed exceptional significance. Of the total properties, 105 were previously determined eligible by the State Historic Preservation Officer (SHPO) or were already listed. An additional 161 properties were found to be potentially eligible for listing, and 17 properties were found to be potentially eligible for listing as a contributing element to a historic district (Figure 3.8-1).

The survey identified 11 previously-listed historic districts and complexes within the study corridors. These include the Fort Shantok National Historic Landmark (Montville); the North Stonington Village Historic District; the Downtown Norwich Historic District; the Norwich State Hospital; the Laurel Hill Historic District (Norwich); the Preston City Historic District; the Hallville Mill Historic District (Preston); the Poquetanuck Village Historic District (Preston); the American Thermos Bottle Co. (Norwich), the Thames Tow Boat Co. shipyard (New London), and the Westerly Downtown Historic District.

Six additional areas were identified as potentially eligible historic districts. These include:

- the Uncasville Mill area in Montville, a well-preserved and cohesive example of an early 19th century mill and cluster of associated worker's houses
- The U. S. Coast Guard Academy in New London, a 1932 Colonial Revival-Style campus
- the Hewitt area in North Stonington, a cohesive remnant of the agricultural landscape, which includes 10 properties, farm fields, and a family cemetery
- the Taugwonk/Stony Brook area in Stonington and North Stonington, a cohesive remnant of a larger agricultural landscape, and which includes the Wheeler farm, properties on the Miner Pentway, and other 18th century structures

- the Wintechog area in North Stonington, a cohesive fragment of a larger historical landscape, which includes 2 farms and agricultural fields
- the White Rock historic area in Westerly, a cohesive and comprehensive example of a 19th century mill village, which includes the former White Rock Mill, the mill race, and workers housing.

The survey also identified a wide range of potentially eligible individual properties within the study corridors, which include various 18<sup>th</sup>, 19<sup>th</sup>, and early 20<sup>th</sup> century residential structures, historic cemeteries, monuments, bridges, the Dixon Quarry and freight yard granite derrick in Westerly, the former gas station on Route 2 in Preston, and the Montville Town Hall.

---

### 3.8.3 Historic Resource Impacts

Potential direct impacts to historic resources were assessed using GIS to determine the number of properties on, eligible for, or potentially eligible for the NRHP that would be within the right-of-way footprint of each of the project alternatives. Direct impacts include physical impacts such as demolition or land taking. The evaluation does not assess or quantify indirect impacts; this level of analysis will be undertaken for the proposed action. The assessment of project effects makes a preliminary determination as to whether a specific project element may directly impact a historic “structure” (individual buildings, sites or objects) or a historic “property” (the land on which the historic structure is located).

Table 3.8-1 provides an assessment of the potential direct impacts of each element of the project as well as each of the alternatives.

**Table 3.8-1**  
**Potential Impacts to Historic Resources**

Element	Historic Districts Affected (Designated/ Potential)	Number of Historic Structures Affected	Number of Historic Properties Affected
Transitway	4 (2)	4	24
Busway	2 (2)	3	16
Route 2A Bridge	0	0	0
S Transit Bridge	0	0	0
N Transit Bridge	0	0	0
NEC Stations	0	0	0
Transit Stations	0	0	1
Rt 32 Upgrade	0	0	0
Rt 164 Upgrade	1	0	0
Rt 2 Norwich Upgrade	0	0	0
Rt 2 Upgrade, North Stonington	0 (1)	2	13
Rt 2 Widening, Preston	0	3	6
Rt 2 Widening, North Stonington	0 (1)	9	15
Route 2A Bypass	0	3	4
Route 2 Bypass	(2)	1	4

**Table 3.8-2**  
**Summary of Impacts to Historic Resources**

Alternative	Districts (potentially eligible)	Structures	Properties
A	0	0	0
B	4 (3)	6	38
C	4 (3)	6	38
D	2 (3)	5	29
E	0 (1)	15	25
F	0 (3)	7	14

None of the alternatives under consideration would have an adverse effect on any cemetery. Each of the alternatives would affect properties that are potentially eligible for listing, including potential National Register districts.

Alternatives B and C would have similar effects. These would cross through the Hallville Historic District, and through the northeast portion of the North Stonington Historic District. The Norwich East Transportation Center would be within the Downtown Norwich Historic District, and would require minor new construction in addition to that planned by the City of Norwich. Construction would occur adjacent to several National Register properties, including the Thames Tow Boat Company, the American Thermos Bottle Company, Westerly Downtown Historic District, and Fort Shantok. All construction within the historic districts would be within the existing railroad rights-of-way and would not directly affect these properties or districts. A new bridge would be constructed adjacent to the P&W Shetucket River bridge. The monorail option would have a visual impact on the Westerly Downtown Historic District that would not be consistent with the existing rail. In addition, these alternatives would have a minor affect on the White Rock area, and the upgrade of Route 2 would affect the Hewitt area by removing stone walls. Each of these alternatives would directly impact 6 structures, and 38 properties that contain structures, that are potentially eligible for listing.

Alternative D would cross through the northeast portion of the North Stonington Historic District. The Norwich East Transportation Center would be within the Downtown Norwich Historic District, and would require minor new construction in addition to that planned by the City of Norwich. Construction would occur adjacent to the Westerly Downtown Historic District. All construction would be within the existing railroad right-of-way and would not directly affect this district. In addition, Alternative D would have a minor affect on the White Rock area, and the upgrade of Route 2 would affect the Hewitt area by removing stone walls. This alternative would directly impact 5 structures, and 29 properties that contain structures, that are potentially eligible for listing.

Alternative E will require construction adjacent to the North Stonington and Preston City Historic Districts, but would not affect any structure or property within these districts, as all work would be confined to the right-of-way. The widening of Route 2 may affect a portion of the John Randall House in North Stonington. This alternative would directly impact 15 structures that are potentially eligible for listing, and 25 properties containing potentially-eligible structures. The majority of these impacts are associated with widening Route 2 through North Stonington. Widening Route 2 would also affect the Hewitt area. The upgrades of Route 32 would require construction within the right-of-way adjacent to several potentially-eligible structures and the Uncasville Mill area, but would not affect these properties.

Alternative F would not affect any listed National Register district or property. The Route 164 upgrade element would require roadway improvements within the Preston City Historic District, but would not affect any structure or property within this district, as all work would be confined

to the right-of-way. This alternative would directly impact 7 structures that are potentially eligible for listing, and 14 properties containing potentially-eligible structures. These impacts are distributed throughout the Route 2A Bypass, the Route 2 Bypass, and widening Route 2 in Preston. The Route 2 Bypass would affect two potentially-eligible districts in Stonington and North Stonington, the Taugwonk-Stony Brook area and the Wintechog area. Construction of this road would not directly affect the John Randall property, but may alter the character of the surrounding land. The upgrades of Route 32 would require construction within the right-of-way adjacent to several potentially-eligible structures and the Uncasville Mill area, but would not affect these properties.

---

#### 3.8.4 Mitigation

Several mitigation elements would be considered to mitigate for adverse effects to known or potential historic resources. Following the selection of a preferred alternative, additional investigations to document the location, extent and significance of historic resources will be undertaken, and alignment modifications that would avoid or minimize impacts to historic resources will be developed. Mitigation for impacts to NRHP resources could include HABS/HAER documentation, relocation of a historic structure, or the installation of vegetative screening to mitigate for changes in the visual setting.

---

### 3.9 Archaeological Resources

This section evaluates existing archaeological resources within the study area, describes impacts from the project on archaeological resources, and discusses potential mitigation measures. The *Archaeological Technical Report* (available for review at Town Halls and public libraries within the study area and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures. Archaeological resources are protected under Section 106 of the National Historic Preservation Act and under Section 4(f) of the Transportation Act.

---

#### 3.9.1 Methodology

The archaeological assessment consisted of background research and field investigations designed to locate and identify known archaeological resources associated with prehistoric Native American and early historic activities within the study corridors.

---

### 3.9.2 Potential Archaeological Resources

The study area includes portions of the eastern uplands and the eastern coastal slope of Connecticut. Archaeological and ethnohistoric evidence have shown that this area has been occupied by indigenous populations throughout the last 10,000 years. Studies have identified PaleoIndian, Archaic and Woodland-Period sites in the project area, documenting an extensive cultural and ecological history. In particular, archaeological data indicates a large Native American population in the Late Woodland Period, occupying main villages located along estuaries and rivers. At the time of European settlement, the region was a population center for Native Americans. Following an extended period of economic and military competition between European nations and between the Native American tribes, the English suppressed the local tribes and established large inland townships, which followed the classic New England pattern of agrarian development, while coastal towns became cosmopolitan centers for maritime trade. The result of the early European settlement of the area and the enduring presence of Native American societies has left a rich documentary legacy with implications for the Native American and EuroAmerican archaeological resources likely to be encountered in the project area.

Archaeological sensitivity is defined as the likelihood for prehistoric and historic period resources to be present. The study corridors were classified into areas of low, moderate, and high archaeological sensitivity based on environmental conditions, the presence of known archaeological sites, and the degree of existing and past disturbance. The overall sensitivity of each study corridor can be generally described as moderate with isolated pockets of high sensitivity and large areas of low archaeological sensitivity where development has occurred. The locales of moderate to high archaeological sensitivity tend to be undisturbed wooded tracts or meadows near wetlands and streams, as well as historic foundations and cemeteries. Several corridors (the Transitway, Route 32, Route 164, Route 2 in North Stonington, the Route 2 Bypass, and the Route 2A Bypass corridors) contain historic cemeteries. The Transitway, Route 2 and Route 2A Bypass corridors also contain known prehistoric and historic archaeological sites.

---

### 3.9.3 Impacts to Archaeological Resources

Impacts to archaeological resources were assessed using GIS to overlay the alternative concepts (limits of new right-of-way, limits of stations, and limits of new pavement for the upgrade elements) on the mapping of areas of high and moderate archaeological sensitivity, cemeteries, and known archaeological sites (Figure 3.9-1). None of the alternatives under

consideration would affect any cemeteries. Table 3.9-1 provides a summary of potential impacts to archaeological resources based on the number of known sites likely to be affected and the total area of high- and moderate-sensitivity within the “footprint” of each of the alternatives.

**Table 3.9-1**  
**Impacts of Project Elements on Archaeological Resources**

Element	Known Sites	High Sensitivity		Moderate Sensitivity		Total	
		Hectares	Acres	Hectares	Acres	Hectares	Acres
Transitway	1	11.8	29.1	8.5	21.0	20.3	50.1
Busway	1	4.9	12.1	5.1	12.6	10.0	24.7
Route 2A Bridge	0	0	0	0	0	0	0
Southern Transit Bridge	0	0	0	0	0	0	0
Northern Transit Bridge	0	0	0	0	0	0	0
NEC Stations	0	0	0	0	0	0	0
Transit Stations	1	3.5	8.6	13.1	32.4	16.6	41.0
Route 32 Upgrade	0	<0.1	<0.1	0.9	2.2	1.0	2.47
Route 143 Upgrade	0	0.8	2.0	1.6	4.0	2.4	5.9
Route 2 Upgrade – Norwich	0	0.8	2.0	3.1	7.7	3.9	9.6
Route 2 Upgrade – Rt 214 to I-95	0	3.4	8.4	13.2	32.6	16.6	41.0
Route 2 Widening, Preston	0	0.6	1.5	3.6	8.9	4.2	10.4
Route 2 Widening – Rt 214 to I-95	0	5.1	12.6	17.1	42.2	22.2	54.8
Route 2A Bypass	1	5.1	12.6	9.3	23.0	14.4	35.6
Route 2 Bypass	0	15.9	39.3	23.2	57.3	39.1	96.6

**Table 3.9-2**  
**Impacts of Alternatives to Archaeological Resources**

Alternative	Known Sites	High Sensitivity		Moderate Sensitivity		Total Impacts	
		Hectares	Acres	Hectares	Acres	Hectares	Acres
A	0	0	0	0	0	0	0
B	2	15.2	37.5	21.6	53.4	36.8	90.9
C	2	15.2	37.5	21.6	53.4	36.8	90.9
D	1	12.6	31.1	22.4	55.3	35	86.4
E	1	11.7	30	34	84	45.7	112.9
F	1	22.5	55.6	40.1	99.1	62.6	154.7

Alternatives A, the No-Action alternative, would not affect any known or potential archaeological sites. Each of the other alternatives would affect 1 or 2 known sites, and traverses areas of archaeological sensitivity. Alternative D would have the least effect on areas of potential sensitivity, as it would traverse only 30.5 ha (75.3 ac) of high and moderate areas. Alternative F could have the most effect, with a total of 62.6 ha (154.7 ac) of high- and moderate-sensitivity areas included within the limits of this concept. The majority of impacts associated with Alternative F are within the limits of the Route 2 Bypass.

### 3.9.4 Mitigation

Once a preferred alternative is selected, a reconnaissance-level archaeological survey will be conducted within those areas identified as having moderate and high archaeological sensitivity. The scope of the survey would be developed in consultation with the CHC and the RIHPHC.

## 3.10 Public Parks, Wildlife Refuges and Recreation Areas

Section 4(f) of the Department of Transportation (DOT) Act of 1966 stipulates that before taking any action that uses land from a publicly-owned park, recreation area, wildlife or waterfowl refuge, or from a historic property listed on or eligible for the NRHP, a United States DOT agency must determine that:

- 1) there are no feasible and prudent alternatives to the use of the land from the property, and
- 2) the proposed action includes all planning to minimize harm to the property resulting from such use.

Section 6(f) of the Land and Water Conservation Act requires the Department of the Interior to approve the conversion of any property obtained or developed with grant monies from the Land and Water Conservation Act to a nonrecreational purpose.

This section lists the public parks, wildlife refuges, and recreation areas within the study area. Section 3.8 discusses historic resources. This section also describes the project impacts to these properties and discusses potential mitigation measures. The *Public Parks, Wildlife Refuges and Recreation Areas and Section 6(f) Technical Report* (available for review at Town Halls and public libraries within the study area, and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures.

---

#### **3.10.1 Methodology**

To identify potential Section 4(f) and Section 6(f) properties within the study area, town planners and other representatives of study area communities were asked to list any parks, recreational areas, wildlife management areas (WMAs) or dedicated open space parcels within the study corridors. After this information had been gathered, tax maps and field cards from each municipality's tax assessor's office were used to determine if any of the parcels listed were public parks, recreation areas, wildlife refuges, or Section 6(f) properties. The CTDEP also provided a list of Section 6(f) properties within the study area.

---

#### **3.10.2 Existing Public Parks, Wildlife Refuges, and Recreation Areas**

Public parks, wildlife refuges and recreation areas within the study corridors include two state-owned Wildlife Management Areas, three state-owned boat ramps, and several municipal parks or public recreation areas, as listed in Table 3.10-1. There are a number of other public and privately owned open space and conservation lands in the study area, but these do not meet the definition of Section 4(f) or Section 6(f) properties.

**Table 3.10-1**  
**Public Parks, Wildlife Refuges, Public Recreation Areas and Section 6(f) Properties**

Municipality	Street Address	Property Owner	Property	4(f)	6(f)
Ledyard	42 Rose Hill Road	State of Connecticut	Rose Hill Wildlife Management Area	Yes	Yes
Ledyard	Shewville Road	Town of Ledyard	Whitehall Park	Yes	
Montville	236 Fort Shantok Road	United States Indian Trust	Fort Shantok Park	Yes	
Montville	Point Breeze Road	State of Connecticut	Point Breeze Boat Ramp	Yes	Yes
North Stonington	Rocky Hollow Road	State of Connecticut	Assekunk Swamp West	Yes	
North Stonington	Rocky Hollow Road	State of Connecticut	Assekunk Swamp East	Yes	
North Stonington	297 Norwich-Westerly Road	Town of North Stonington	Wheeler High School playing fields	Yes	
North Stonington	32 Rocky Hollow Road	Town of North Stonington	Rocky Hollow Recreation Area	Yes	
Preston	Route 164	State of Connecticut	DEP Boat Ramp	Yes	
Preston	Rose Hill Road	State of Connecticut	Rose Hill Wildlife Management Area	Yes	Yes
Preston	Lincoln Road	Town of Preston	Milton Green Park	Yes	Yes
Preston	Route 164	Town of Preston	Downer-Doanne Park	Yes	
Westerly	White Rock Road	Town of Westerly	Gingerella Recreation Area	Yes	

### 3.10.3 Impacts to Public Parks, Wildlife Refuges, and Recreation Areas

Impacts on public parks, wildlife refuges and recreation areas that are potentially Section 4(f) properties or which have received funds under Section 6(f) of the Land and Water Conservation Fund (LWCF) program may include a direct loss of property and/or a change in the function or use of the resource. A summary of the composite impacts for the No Action (Alternative A) and five build alternatives (Alternatives B-F) is provided in Table 3.10-2. Additional details of the impact analysis are available in the *Public Parks, Wildlife Refuges, and Recreation Areas Technical Memorandum*. Impacts to public parks, wildlife refuges and recreation areas are illustrated in [Figure 3.8-1](#).

Of the five build alternatives, Alternatives E and F would each potentially impact 2 properties, while Alternatives B and C could affect 3 sites. Alternative D would affect one site. The No-Action alternative (Alternative A) would have no effect on any public parks, wildlife refuges or recreation areas in the study area.

Alternative D would result in the loss of 0.1 hectares (0.2 acres) of the Gingerella Sports Complex in Westerly, RI. Construction of the busway

could affect use of basketball and tennis courts, a playground, and a parking area. The busway at this location would be constructed on fill, higher than the existing park, and would be immediately adjacent to Route 78 after crossing over White Rock Road.

Portions of the Assekunk Swamp Wildlife Management Area (WMA) would be affected by Alternatives E and F. The Route 2 Widening from Route 214 to I-95 would result in the loss of 0.1 hectares (0.2 acres) under Alternative E. The Route 2 Bypass would result in the loss of 4.3 hectares (10.7 acres) under Alternative F. The area of the Assekunk Swamp WMA affected by the Route 2 Widening is adjacent to the existing road and is not anticipated to affect recreational uses like hunting and hiking. The portion of the WMA potentially affected by the Route 2 Bypass currently has no trails or roads, and is not used by hikers or for passive recreation, although it is used by hunters. The loss of some natural area (primarily forest) would impact the preservation function of the Assekunk Swamp WMA. Both alternatives would also result in the loss of a small area of the Rose Hill WMA adjacent to existing Route 2.

The impact to the largest number of properties would result from Alternatives B or C. The transitway and Poquetanuck Station would be constructed directly adjacent to Milton Green Park but would not result in the loss of land within the park. Alternatives B and C would also affect the Rose Hill Management Area, also a 4(f) and 6(f) property, which would lose 1.6 hectares (4.0 acres) of open land. Most of this land is along the old trolley corridor. In addition to the direct loss of land area, the intrusion of the transportation corridor would be disruptive to some recreational uses like hunting and hiking as well as eliminate the current access and trail along the old trolley line. Whitehall Park (Ledyard) would be affected by the transitway, which would result in the loss of park land, adversely affect access, and disrupt passive recreation within the park. At the Gingerella complex, basketball and tennis courts, a playground, and parking area would be affected.

**Table 3.10-2**  
**Summary of Impacts to Public Parks, Wildlife Refuges and Recreation Areas**

Alternative	Property Affected	Area Lost
A	No effect.	
B	Rose Hill WMA (6(f))	1.6 ha (4.0 ac)
	Whitehall Park	0.3 ha (0.7 ac)
	Gingerella Sports Complex	0.1 ha (0.2 ac)
C	Same as for Alternative B	
D	Gingerella Sports Complex	0.1 ha (0.2 ac)
E	Assekong Swamp WMA	0.1 ha (0.2 ac)
	Rose Hill WMA	0.1 ha (0.2 ac)
F	Assekong Swamp MWA	4.3 ha (10.7 ac)
	Rose Hill WMA	0.1 ha (0.2 ac)

#### 3.10.4 Mitigation Measures

Mitigation for impacts to public parks, wildlife refuges and recreation areas initially involved the development of alternative alignments that avoided or minimized impacts to these resources. Mitigation for impacts to Section 6(f) resources typically requires replacement with land of equal market value, equal location and equal function (usefulness). Once a preferred alternative is identified, a plan for compensatory replacement of the properties and their functions and values will be developed.

### 3.11 Visual and Scenic Qualities

This section evaluates the existing visual and scenic character of the study area, describes the project visual and scenic impacts, and discusses potential mitigation measures. The *Visual and Scenic Technical Report* (available for review at Town Halls and public libraries within the study area and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures.

---

### 3.11.1 Methodology

The visual and scenic quality resource evaluation followed the FHWA guidelines in *Visual Impact Assessment for Highway Projects* and *Guidance Material on the Preparation of Visual Impact Assessments*.

---

### 3.11.2 Existing Visual and Scenic Qualities

The study area is a landscape mosaic of forested areas, agricultural land, residences and residential neighborhoods, and scattered commercial developments, set into a rolling topography. Views from existing roads are primarily short distances. Prominent features include views of agricultural fields, pastures and barns; single family homes set back from roads, with stone walls and lawns; and trees close to the edge of roads, creating visual “tunnels”. Existing roads provide occasional long-distance views, generally of the forested and agricultural landscape, with some prominent views of features such as Lantern Hill and the Foxwoods casino, which contrasts strongly with the rural landscape. Residences on Jeremy Hill Road have long-distance views to the east across the Assekunk Swamp.

The Thames River is a notable landscape feature, with a broad river channel bordered by abrupt low hills. Views from the river also include industrial and maritime developments of varying visual quality. Views from the existing Mohegan-Pequot Bridge include wide vistas of the river landscape extending north to Norwich.

Approximately 0.7 km (0.4 mi) of Route 164, extending from the Route 165 intersection south, is within the portion of Route 164 designated by ConnDOT as a Scenic Road. The scenic character of this road segment is attributed to its historic character and the historic buildings of Preston City. Route 2A through Poquetanuck Village is not formally designated as scenic, but has historic character.

---

### 3.11.3 Visual and Scenic Quality Impacts

This section examines and summarizes the impacts to visual and scenic resources associated with each of the alternatives evaluated in this Draft EIS. It considers the views from each alternative, and the views of each alternative from existing roads and properties. Alternative A (No-Action) would not affect the visual environment within the study area. Additional information is provided in the *Visual and Scenic Resources Technical Report* and is summarized in Table 3.11-1.

Alternative B would provide dramatic scenic new views from the transitway, including views across picturesque rolling topography with alternating

forested areas, open fields and farmsteads. Transit and rail patrons would have outstanding new views of the Thames River. Overpasses required for crossings of Route 2 in North Stonington and Ledyard, and for two crossings of Route 2A in Preston, would adversely affect views of the rural landscape and the Hallville Historic District. The two new bridges (over the Shetucket and Pawcatuck Rivers) are not anticipated to create adverse views of the river, as these will be adjacent to existing bridges. However, bridge design should be consistent with the historic bridge structures at both the P&W Shetucket River bridge and the White Rock Road bridge to avoid adverse visual contrasts. The large parking structures at I-95 and the Norwich State Hospital would affect views from Route 12 and Route 49. The transitway, in areas where it would be adjacent to existing roads, as in North Stonington, could adversely affect views of fields and farmsteads from Route 2 due to the above-ground features such as overhead catenary or elevated monorail structures. Overall, the monorail would have a more substantial adverse effect than the light rail, due to the large, continuous above-ground structure.

Alternative C would have similar effects. The new bridge across the Thames River would afford transit patrons outstanding new views of the river and the Norwich waterfront. The southern transit bridge would not be likely to result in adverse visual impacts, as it would be directly adjacent to the existing Route 2A bridge. The northern transit bridge would be likely to result in adverse visual impacts from the Route 2A bridge, properties adjacent to the river, and to boaters on the Thames River. This new bridge would obscure some views of the river and would create a new and substantial structure spanning the river.

Alternative D would provide dramatic scenic new views from the transitway, including views across picturesque rolling topography with alternating forested areas, open fields and farmsteads. Overpasses required for crossings of Route 2 in North Stonington would adversely affect views of the rural landscape. The new bridge over the Pawcatuck River is not anticipated to create adverse views of the river, however, bridge design should be consistent with the historic bridge structure at White Rock Road to avoid adverse visual contrasts. The large parking structure at I-95 would affect views from Route 49. Upgrades to Route 2 in North Stonington could affect the visual quality of this roadway by removing vegetative screening or relocating stone walls.

Alternative E would provide dramatic new views of Poquetanuck Cove, forest, and open agricultural fields from the Route 2A Bypass. The new roadway would have an adverse impact on views from residences. The overpasses at Middle Road, Harris Fuller Road, and Route 2A would affect views of the rural landscape. Widening Route 2, particularly in North Stonington, would degrade the visual character of the rural landscape by removing trees, stone walls, and some buildings that contribute to the cohesiveness of the visual fabric. The widened roadway would also affect

views of Route 2 from adjacent farms. Upgrades to Routes 32 and 164 are not likely to affect views of or from these roads, with the exception of minor impacts due to loss of vegetative screening. Impacts to the designated scenic road portion of Route 164 would be negligible. The addition of a second bridge over the Thames River would not substantially affect views of or from the river due to the proximity to the existing bridge.

Alternative F would provide dramatic new views of, forest, and open agricultural fields from the Route 2A and Route 2 Bypasses. The new roadway would have an adverse impact on views from residences, and the overpasses at Middle Road, Harris Fuller Road, Route 2A, North Anguilla Road, Stony Hill Road, Route 184, Jeremy Hill Road, Mystic Road, and Wintechog Road would affect views of the rural landscape. The new road would also affect views of the landscape from residences along Sherwood Drive, the Miner Pentway, Jeremy Hill Road, and other adjacent neighborhoods. Widening Route 2 in Preston would have a minor impact on the visual character of the rural landscape by removing trees, stone walls, and some buildings that may contribute to the cohesiveness of the visual fabric. The widened roadway would also affect views of Route 2 from adjacent residences. Impacts from the upgrades to Routes 32 and 164 and the new Route 2A bridge would be similar to those described for Alternative E.

**Table 3.11-1**  
**Summary of Visual Impacts**

Alternative	Adverse Impacts	Comments
A (No Action)	None	
B	Impacts to views from existing roads and residential areas. Some impacts to views to and from historic districts. Parking structures at I-95 and Norwich State Hospital will alter views from existing roads. Upgrade of Route 2 in North Stonington would have minor impacts due to loss of vegetation and some scenic elements.	Transitway will provide scenic views of forested and agricultural landscape. Pleasing views from many of the rail stations.
C	Similar to Alternative B. Northern transit bridge would have a adverse effect on views of and from the Thames River.	Similar to Alternative B
D	Impacts to views from existing roads and residential areas. Some impacts to views to and from historic districts. Parking structure at I-95 will alter views from existing roads.	Transitway will provide scenic views of forested and agricultural landscape.
E	Rt 2A Bypass would have impacts to views of the rural landscape along Harris Fuller and Middle Roads. Minor visual impacts along Routes 32 and 164 due to loss of vegetative screening. Widening of Route 2, particularly in North Stonington, would have impacts due to loss of vegetation and scenic elements	New roadway would create scenic views of forested and agricultural landscapes.
F	Route 2 and Route 2A Bypasses would have impacts to views of the rural landscape. Minor visual impacts along Routes 32 and 164 due to loss of vegetative screening. Widening of Route 2 in Preston would have minor impacts.	New roadways would create dramatic views of rural and forested landscapes.

#### 3.11.4 Mitigation Measures

Once a design is developed for the preferred alternative, specific mitigation measures will be identified and incorporated into a landscaping plan. Potential mitigation measures may include planting screening vegetation or revegetating disturbed areas with native plant species.

### 3.12 Air Quality

The air quality study evaluated the impacts due to the implementation of the Route 2/2A/32 Transportation Improvements. The study includes a regional (mesoscale) and localized (microscale) evaluation of mobile source pollutants. The mesoscale analysis evaluated the ozone precursor impacts of VOCs and NOx. The microscale analysis evaluated CO concentrations at receptor locations. Additional information is provided in the *Air Quality Analysis Technical Report* (available for review at Town Halls and public libraries within the study area, and at ConnDOT).

The study area is located in the Greater Connecticut nonattainment area, which has been classified by the EPA as a “Serious” ozone non-attainment area and the Rhode Island statewide non-attainment area, which is also classified as “Serious”. The study area is located in a CO attainment area for both Connecticut and Rhode Island. The 1990 CAAA requires projects located in ozone non-attainment areas to demonstrate that the impact of their regional emissions be consistent with the emission requirements established in the appropriate State Implementation Plan (SIP). Projects located in CO attainment areas must demonstrate that they do not create new CO violations at any location.

---

### 3.12.1 Methodology

The mesoscale analysis was conducted to estimate the regional emissions of VOCs and NO<sub>x</sub> from motor vehicles for a typical day during the ozone season (summer). The purpose of the mesoscale analysis was to provide emission data to compare project alternatives. The emissions for each alternative were developed from traffic and emission factor data.

The traffic data included traffic volumes, roadway lengths, and vehicle speeds. These data were obtained from Connecticut’s statewide travel demand forecasting model. The statewide model assigns trips to the highway and transit networks to estimate link traffic volumes and travel speeds on a link by link basis. This model was run for each alternative and the Route 2/2A/32 study area was extracted out of the statewide network.

The emission factors used in the mesoscale analysis were obtained using the latest version of the EPA’s MOBILE5b emissions model. MOBILE5b is a mathematical computer model that is used to calculate VOC and NO<sub>x</sub> emission rates for vehicles in grams per vehicle-mile. The emission factors were adjusted to reflect Connecticut-specific conditions for the ozone season, such as the Vehicle Inspection and Maintenance Program, a Stage II Vapor Recovery System, and temperatures for the ozone (summer) season were used.

The traffic and emission factor data were developed for 1998 and for each alternative in the estimated year of project completion (2010), and design year (2020). The mesoscale analysis calculated the change in regional emissions due to the changes in these parameters.

The microscale analysis evaluated the local impacts of the CO concentrations for the same years and alternatives as the mesoscale analysis. The objective of the microscale analysis is to evaluate the CO concentrations at congested locations, typically intersections, in the study area during the peak CO season (winter). The study was evaluated to identify the locations with the potential for the highest CO concentrations, typically intersections. The intersections in the study area were ranked based on traffic volumes and level of service. The

following areas were selected for analysis because they would be the most affected by project-related traffic in the study area (Figure 3.12-1):

- Route 2 at Route 2A/Route 117 and Paster Road
- Route 2 at Route 2A Bypass
- Route 32 at Route 163 and Depot Road
- Route 2 at I-95 Northbound Off Ramp (Exit 92)
- Route 2 at Route 2 Bypass (north of I-95)

The EPA's CAL3QHC computer model (Version 2) was used to predict the maximum 1-hour CO concentrations at the receptor locations. The CAL3QHC model calculated the air quality impacts from vehicles in both free-flow and idle operation by creating a three dimensional model that represents the roadway and receptor site geometry. Traffic, emission, and meteorological data were entered into the model to predict maximum 1-hour CO concentrations at the receptor locations. The 8-hour CO concentrations were derived by multiplying the 1-hour CO concentrations by a persistence factor, which is based on monitoring data.

The traffic data used in the microscale analysis were representative of the evening peak hour. Vehicle speeds were developed based upon travel speed observations made during peak traffic periods. The traffic analysis for the 3 transit alternatives determined that there would not be a noticeable change in the traffic data at the 5 intersections that were being evaluated in the microscale analysis. As a result, traffic data was only developed for Alternative C. The microscale analysis evaluated the air quality impacts for Alternative C and presented these results for Alternatives B and D.

The vehicle emission factors used in the microscale analysis were also obtained using EPA's MOBILE5b emissions model. The emission rates calculated in this study have been adjusted to reflect Connecticut-specific conditions for the CO season, such as an Inspection and Maintenance Program, a Stage II Vapor Recovery System, and winter temperatures.

The future estimates of project-related regional and local emissions are based on changes in traffic and emission factor data and roadway geometry. The traffic data include traffic volumes, vehicle-miles-of-travel, signal cycle timing, and physical roadway improvements. The emission factor data include years of analysis and roadway speeds.

---

### 3.12.2 Air Quality Impacts

Air quality impacts were calculated for each alternative's effects on regional air quality (mesoscale analysis) and on local air quality (microscale analysis). The results of each analysis are presented below.

### 3.12.2.1 Mesoscale Analysis

The mesoscale analysis calculated the 1998 regional emissions from the major roadways in the study area. The 1998 regional emissions represent the current traffic volumes and operating conditions in the study area. These emissions, estimated to be 3,783 kilograms/day (kg/day) of VOCs and 7,677 kg/day of NO<sub>x</sub>, establish a baseline to which future emissions are compared. Table 3.12-1 provides the results of the Mesoscale Analysis for 1998 existing conditions and for each alternative for the 2010 and 2020 conditions.

**Table 3.12-1  
Mesoscale Analysis Results\***

Alternative	Pollutant	
	VOC	NO <sub>x</sub>
1998 Existing Condition	3,783	7,677
2010 Alternative A	1,510	3,855
2010 Alternative B1	1,499	3,833
2010 Alternative C1	1,498	3,831
2010 Alternative D	1,501	3,838
2010 Alternative E	1,473	3,799
2010 Alternative F	1,477	3,858
2020 Alternative A	1,610	3,931
2020 Alternative B1	1,598	3,908
2020 Alternative C1	1,597	3,906
2020 Alternative D	1,600	3,913
2020 Alternative E	1,570	3,874
2020 Alternative F	1,573	3,936

\*Kilograms per day

For Alternative A, the No-Action alternative, VOCs and NO<sub>x</sub> emissions are substantially lower for both the 2010 and 2020 condition than the 1998 emissions, even though there is an increase in traffic within the study area. This reduction in motor vehicle emissions is the result of ongoing air quality programs such as the Federal Motor Vehicle Emission Control program and the Connecticut Vehicle Inspection and Maintenance program.

Under all of the 2010 and 2020 Build Alternatives, VOC and NO<sub>x</sub> emissions are lower than the No-Build Alternatives, except for Alternative F. The small increase in NO<sub>x</sub> emissions from this alternative is likely due to changes in the

roadway speed characteristics. Alternative E results in the largest reductions in VOC and NOx emissions.

### **3.12.2.2 Microscale Analysis**

The microscale analysis results show that the existing 1-hour CO concentrations range from a minimum of 5.8 parts per million (ppm) at the intersection of Route 32 and Route 163 to a maximum of 7.0 ppm at the intersection of Route 2 and the I-95 Northbound Off Ramp (Table 3.12-2). The corresponding maximum 8-hour CO concentrations range from a minimum of 4.8 ppm to a maximum of 4.9 ppm (Table 3.12-3). All the existing 1-hour and 8-hour concentrations are below the CO NAAQS of 35 and 9 ppm, respectively. The existing CO concentrations are consistent with the study area's attainment designation. The study area is currently in attainment for CO NAAQS.

The microscale analysis demonstrated that the study area will continue to remain in attainment in the future for all alternatives, and that none of the alternatives would result in any violations of the NAAQS. The 1- and 8-hour CO concentrations for Alternatives B, C, D, E, and F are all below the CO NAAQS of 35 and 9 ppm.

**Table 3.12-2**  
**Predicted Maximum 1-Hour CO Concentrations\***

Receptor No. and Location**	1998 Existing Condition	2010 No-Build Condition	2010 Build Alt. C***	2010 Build Alt. E	2010 Build Alt. F	2020 No-Build Condition	2020 Build Alt. C***	2020 Build Alt. E	2020 Build Alt. F
<b>Route 2 at Route 2A/Route 117 and Paster Road</b>									
1 Open Space	6.9	5.6	5.6	5.7	5.8	5.5	5.5	5.7	5.9
2 Southwest Quadrant	6.4	5.5	5.4	5.7	5.8	5.5	5.4	5.7	5.8
3 154 Preston St. Restaurant	5.8	5.4	5.4	5.6	5.6	5.4	5.4	5.6	5.6
4 148 Preston St (residence)	6.1	5.4	5.4	5.6	5.7	5.4	5.4	5.7	5.7
<b>Route 2 at Route 2A Bypass</b>									
5 Southeast Quadrant	5.1	5.0	5.0	5.6	5.6	5.0	5.0	5.7	5.7
6 Southwest Quadrant	5.3	5.2	5.1	5.9	5.9	5.2	5.2	5.9	5.7
7 North of Intersection	5.4	5.1	5.1	5.7	5.7	5.1	5.1	5.7	5.7
<b>Route 32 at Route 163 and Depot Road</b>									
8 Karate School	5.8	5.4	5.3	5.4	5.4	5.5	5.4	5.5	5.5
9 Gas Station	6.1	5.5	5.4	5.6	5.5	5.5	5.5	5.6	5.6
10 Apartments	6.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
11 Dam	6.6	5.6	5.6	5.5	5.6	5.6	5.6	5.6	5.6
<b>Route 2 at I-95 Northbound Off Ramp</b>									
12 154 Liberty St. (residence)	7.0	6.0	5.9	6.0	6.0	6.0	5.9	6.0	6.0
13 Open Space	6.8	5.8	5.9	6.0	6.0	5.8	6.0	6.0	6.0
14 Open Space	6.7	6.0	5.9	6.0	6.0	6.0	5.9	6.0	6.0
<b>Route 2 and Route 2 Bypass</b>									
15 Southeast Quadrant	5.9	5.5	5.6	5.6	6.0	5.5	5.6	5.6	6.2
16 Southwest Quadrant	5.9	5.4	5.6	5.6	6.2	5.4	5.6	5.6	6.2
17 Northwest Quadrant	5.7	5.4	5.5	5.5	6.2	5.5	5.5	5.5	6.1
18 Northeast Quadrant	6.0	5.5	5.7	5.7	6.1	5.5	5.7	5.7	6.2

Source: Vanasse Hangen Brustlin, Inc.

\* The values are expressed in parts per million (ppm) and include 1-hour background concentration of 5.0 ppm and 8-hour background concentration of 3.5 ppm. The NAAQS maximum for a 1-hour period is 35 ppm. The NAAQS maximum for a 8-hour period is 9 ppm.

\*\* Refer to the Appendix for the location of sensitive receptors. Results presented for highest CO concentration receptor only. Maximum CO concentrations at other receptors are presented in the Appendix.

\*\*\* Alternatives B and D are expected to have results similar to Alternative C.

N/A = not applicable. The bypass intersections were analyzed only for the applicable build alternative.

**Table 3.12-3**  
**Predicted Maximum 8-Hour CO Concentrations\***

Receptor No. and Location**	1998 Existing Condition	2010 No-Build Condition	2010 Build Alt. C***	2010 Build Alt. E	2010 Build Alt. F	2020 No-Build Condition	2020 Build Alt. C***	2020 Build Alt. E	2020 Build Alt. F
<b>Route 2 at Route 2A/Route 117 and Paster Road</b>									
1 Open Space	4.8	3.9	3.9	4.0	4.1	3.9	3.9	4.0	4.1
2 Southwest Quadrant	4.5	3.9	3.8	4.0	4.1	3.9	3.8	4.0	4.1
3 154 Preston St. Restaurant	4.1	3.8	3.8	3.9	3.9	3.8	3.8	3.9	3.9
4 148 Preston St (residence)	4.3	3.8	3.8	3.9	4.0	3.8	3.8	4.0	4.0
<b>Route 2 at Route 2A Bypass</b>									
5 Southeast Quadrant	3.6	3.5	3.5	3.9	3.9	3.5	3.5	4.0	4.0
6 Southwest Quadrant	3.7	3.6	3.6	4.1	4.1	3.6	3.6	4.1	4.1
7 North of Intersection	3.8	3.6	3.6	4.0	4.0	3.6	3.6	4.0	4.0
<b>Route 32 at Route 163 and Depot Road</b>									
8 Karate School	4.1	3.8	3.7	3.8	3.8	3.9	3.8	3.9	3.9
9 Gas Station	4.3	3.9	3.8	3.9	3.9	3.9	3.9	3.9	3.9
10 Apartments	4.2	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
11 Dam	4.6	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
<b>Route 2 at I-95 Northbound Off Ramp</b>									
12 154 Liberty St. (residence)	4.9	4.2	4.1	4.2	4.2	4.2	4.1	4.2	4.2
13 Open Space	4.8	4.1	4.1	4.2	4.2	4.1	4.2	4.2	4.2
14 Open Space	4.7	4.2	4.1	4.2	4.2	4.2	4.1	4.2	4.2
<b>Route 2 and Route 2 Bypass</b>									
15 Southeast Quadrant	4.1	3.9	3.9	3.9	4.2	3.9	3.9	3.9	4.3
16 Southwest Quadrant	4.1	3.8	3.9	3.9	4.3	3.8	3.9	3.9	4.3
17 Northwest Quadrant	4.0	3.8	3.9	3.9	4.3	3.9	3.9	3.9	4.3
18 Northeast Quadrant	4.2	3.9	4.0	4.0	4.3	3.9	4.0	4.0	4.3

Source: Vanasse Hangen Brustlin, Inc.

\* The values are expressed in parts per million (ppm) and include 1-hour background concentration of 5.0 ppm and 8-hour background concentration of 3.5 ppm. The NAAQS maximum for a 1-hour period is 35 ppm. The NAAQS maximum for a 8-hour period is 9 ppm.

\*\* Refer to the Appendix for the location of sensitive receptors. Results presented for highest CO concentration receptor only. Maximum CO concentrations at other receptors are presented in the Appendix.

\*\*\* Alternatives B and D are expected to have results similar to Alternative C.

N/A = not applicable. The bypass intersections were analyzed only for the applicable build alternative.

---

### 3.13 Noise

This section evaluates existing noise in the study area, describes the project's noise impacts, and discusses potential noise mitigation measures. *The Noise Analysis Technical Report* (available for review at Town Halls and public libraries within the study area and at ConnDOT) contains additional details.

---

#### 3.13.1 Methodology

ConnDOT, FHWA, and FTA noise impact assessment procedures for highway and rail/transit projects were used to identify sensitive receptor locations and to measure existing noise levels in the study area. The sensitive receptor locations were selected along all the major corridors in the study area including Route 2 and Route 2A, and many of the collector roads, such as Route 32, and Route 164, based upon their land uses.

The existing sound levels and proposed roadway designs were used to predict project-related noise impacts.

---

#### 3.13.2 Existing Noise

Over 1,200 receptor sites were identified along the existing and proposed roadways and rail/transit corridors. These receptor sites included residences, churches, public buildings, and commercial buildings. For the purpose of conducting the noise analysis, these receptor sites were grouped into 42 receptor locations (Figure 3.12-1).

The ConnDOT/FHWA joint policy (1997) defines adverse noise impacts as existing or predicted sound levels that approach (within 1 decibel [dBA]) or exceed the FHWA noise abatement criteria (NAC), or when future sound levels exceed existing sound levels by 15 dBA or more. The existing sound levels approached or exceeded the NAC at 22 of the 42 receptor locations, which represent 682 sites (residential or commercial properties). These peak period sound levels ranged from 43 to 76 dBA. Table 3.13-1 presents the results of the noise monitoring.

Connecticut Department of Transportation  
Route 2/2A/32 Draft Environmental Impact Statement

**Table 3.13-1  
1998 Existing Sound Levels**

No.	Receptor Locations			One-Hour Sound Levels in Decibels		
	Corridor	Town	Location	[L <sub>eq</sub> - dBA]		1998 Sound Levels
				Number of Receptor Sites (Residential/Commercial)	FHWA NAC <sup>2</sup> (Res/comm)	
1	NECR	Waterford	Benham Avenue (South side)	30/15	67(72)	47
2	Rt 32	Waterford	Route 32 at Powerhouse Road (South side)	120/30	67(72)	68 <sup>1</sup>
3	NECR	Waterford	Dock Road at Peter Avenue	22/5	67(72)	55
4	Rt 32	Montville	Derry Hill Road at Side Road	13/0	67(72)	47
5	Rt 32	Montville	Route 32 at Derry Hill Road	50/5	67(72)	68 <sup>1</sup>
6	Rt 32	Montville	Route 32 at PTA Lane	35/4	67(72)	68 <sup>1</sup>
7	NECR	Montville	Everett Street	10/1	67(72)	43
8	Transitway	Preston	Route 12 at Thames Apts.	40/15	67(72)	47
9	Transitway <sup>3</sup>	Preston	Route 12 at Route 2A	10/7	67(72)	64
10	Transitway <sup>3</sup>	Preston	Route 12 at Route 2A	5/2	67(72)	64
11	Transitway <sup>3</sup>	Preston	Route 2A at Harris Fuller Road	25/2	67(72)	70 <sup>1</sup>
12	Transitway <sup>3</sup>	Preston	Route 2A at Harris Fuller Road	8/0	67(72)	70 <sup>1</sup>
13	Transitway <sup>3</sup>	Preston	Middle Road (West side)	20/2	67(72)	54
14	Transitway <sup>3</sup>	Preston	Middle Road (East side)	10/2	67(72)	48
15	Transitway <sup>3</sup>	Preston	Route 2 near Schoolhouse Road	55/5	67(72)	69 <sup>1</sup>
16	Rt 2A Bypass	Preston	Route 2 at Maynard Hill Road	125/20	67(72)	71 <sup>1</sup>
17	Transitway	Preston	Route 2A at Lincoln Park Road	10/4	67(72)	64
18	Transitway	Preston	Mathewson Mill Road south of Route 2	10/2	67(72)	64
19	Rt 2	Preston	Route 2 at Mathewson Mill Road	60/5	67(72)	76 <sup>1</sup>
20	Transitway	Preston	Shewville Road south of Rt. 2	5/2	67(72)	56
21	Rt 164	Preston	Route 164 at Route 2	10/1	67(72)	67 <sup>1</sup>
22	Rt 164	Preston	Route 164 at Lynn Drive	25/0	67(72)	66 <sup>1</sup>
23	Rt 164	Preston	Route 164 near Amos Lake	21/1	67(72)	70 <sup>1</sup>
24	Rt 164	Preston	Route 164 at Route 165	18/2	67(72)	63
25	Transitway	Ledyard	Route 2	5/0	67(72)	47
26	Rt 2	Ledyard	Route 2 at Milltown Road	20/0	67(72)	70 <sup>1</sup>
27	Transitway	N. Stonington	Wintechog Hill Road at Wright's Road	15/0	67(72)	47
28	Rt 2 Bypass	N. Stonington	Route 201 at Jeremy Hill Road	20/1	67(72)	66 <sup>1</sup>
29	Rt 2 Bypass	Stonington	Stoney Brook Road at Damato Drive	15/0	67(72)	51
30	Rt 2	N. Stonington	Route 2 at I-95 On-ramp	20/5	67(72)	72 <sup>1</sup>
31	Rt 2	N. Stonington	Route 2 at Main's Crossing	25/4	67(72)	67 <sup>1</sup>
32	Transitway	N. Stonington	Hewitt Road	2/0	67(72)	56
33	Rt 2	N. Stonington	Route 2 at Main Street	30/5	67(72)	66 <sup>1</sup>
34	Transitway	N. Stonington	Rocky Hollow Road at Third Baptist Church	15/4	67(72)	56
35	Rt 2	N. Stonington	Route 2 north of Route 184	20/4	67(72)	64
36	Transitway	N. Stonington	Route 49 north of Route 617	5/2	67(72)	66 <sup>1</sup>
37	Transitway	Stonington	Route 49 at Pawcatuck River	5/0	67(72)	62
38	Rt 2	Stonington	Route 2 south of Elm Ridge Road	43/0	67(72)	67 <sup>1</sup>
39	Rt 2	Stonington	Route 2 at Elm Ridge Road	24/0	67(72)	67 <sup>1</sup>
40	Transitway	Stonington	Route 2 at White Rock Road	11/4	67(72)	67 <sup>1</sup>
41	Transitway	Stonington	Route 2 at White Rock Road	4/1	67(72)	67 <sup>1</sup>
42	Transitway	Westerly	Route 78 east of Route 2	20/15	67(72)	67 <sup>1</sup>

<sup>1</sup> This sound level approaches or exceeds the FHWA noise abatement criterion.

<sup>2</sup> Federal Highway Administration's Noise Abatement Criterion.

<sup>3</sup> These receptor sites are also included in the Route 2A Bypass Corridor.

---

### 3.13.3 Noise Impacts

Noise impacts were considered to include sound levels approaching or exceeding the NAC and the substantial increases in sound levels due to commuter rail, light rail, bus, or passenger vehicle operations. These impacts were determined through FHWA and FTA modeling methodologies. The FHWA and FTA have established noise abatement criteria to help protect the public health and welfare from excessive vehicle traffic and rail noise. ConnDOT and FHWA consider a receptor location to be impacted by noise when:

- the existing or future sound levels approach (within 1 dBA), are at, or exceed the NAC, or
- when the future sound levels exceed the existing sound levels by 15 dBA or more.

It is generally considered that a 0-5 dBA increase/decrease represents a slight change in noise levels, a 6-14 dBA increase/decrease represents a moderate change in noise levels, and a 15 dBA or greater increase/decrease represents a substantial change in noise level. The feasibility of noise mitigation is evaluated when noise impacts are identified at receptor locations.

The sound level predictions were based on peak hour traffic on the travel lanes nearest to the receptor locations during the commuting period. The noise analysis calculated the sound levels for each receptor location and compared the results to the ConnDOT's noise impact criteria to determine if noise abatement measures should be studied. If adverse noise impacts were identified, then mitigation measures were evaluated to determine if noise abatement measures are reasonable, feasible, and likely to be included in the project.

Train warning device noise is another substantial noise source along the rail lines. Typically, a train will conduct two long blasts followed by a short blast, culminating in a final long blast as the train enters a street crossing. The train warning device is a safety measure that provides a warning to people at the street crossings, and is required by the FTA regulations for audible warning devices (49 CFR Chapter 11 Section 229.129). Train warning device noise was not quantified, but was assessed based on the number of at-grade crossings where warning device noise would be generated.

As summarized in Table 3.13-2, each of the alternatives would result in noise impacts and increases in sound levels at receptor sites throughout the study area.

The No-Action Alternative would result in 709 receptor sites above the NAC, with the majority of sites located along Route 2 and Route 32. Alternatives B and C would result in the greatest number of impacts, with 864 affected sites located along the commuter rail line, transitway, and existing Routes 2, 2A, 32, and 164. These alternatives would also require train warning devices at

17 at-grade crossings. This is an increase of 155 sites over the No-Action Alternative. Alternative D would have the fewest adverse impacts. Alternatives E and F would reduce noise impacts along Route 2A. Alternative E would have 84 more noise impacts than Alternative A, and would result in new noise impacts along the Route 2A Bypass corridor. Alternative F would have 9 fewer impacts than Alternative E, largely due to the reduction in noise levels along Route 2, but would affect sites along the Bypass corridor that do not currently experience noise levels approaching the NAC.

**Table 3.13-2**  
**Summary of Noise Impacts (Number of Receptor Sites above the NAC)**

Corridor	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
NECR	0	96	96	0	0	0
Transitway	27	182	182	27	55	55
Busway	0	0	0	46	55	55
Rt 2 Preston	210	210	210	210	210	210
Rt 2 North Stonington	89	113	113	113	113	89
Rt 164	58	58	58	58	58	58
Rt 32	244	244	244	244	244	244
Rt 2A Bypass	0	0	0	0	20	20
Rt 2 Bypass	21	21	21	21	21	36
Route 2A	60	72	72	60	60	60
Totals	709	864	864	775	793	784
Increase from 1998	27	182	182	93	111	102
Increase from Alternative A		155	155	66	84	75

### 3.13.4 Mitigation

The receptor locations that were identified as being impacted were evaluated to determine if noise abatement measures were reasonable, feasible, and likely to be included in the project. The noise abatement measures included:

- Traffic management,
- Alteration of horizontal and vertical alignments, and
- Noise barriers.

Mitigation measures such as traffic management (the re-routing of truck traffic), alterations of horizontal and vertical alignments, and buffer zones are not appropriate or have been implemented to the extent possible.

The primary mitigation measure considered for noise abatement for this project was a noise barrier. Noise barriers provide noise abatement by reducing the transmission of sound waves. This is accomplished by shielding receptor locations from the noise source by blocking the line of sight. Noise barriers are judged as effective when they achieve a 7 dBA or greater noise reduction for the critical receptor locations with noise impacts.

The feasibility and reasonableness of constructing noise barriers were evaluated for the impacted receptor locations along the existing Route 2, 2A, 32, and 164 corridors under all alternatives. The construction of noise barriers was found to not be feasible because of the acoustical and engineering restrictions. The FHWA/ConnDOT Highway Traffic Noise Analysis and Abatement Policies and Procedures states that noise abatement is not considered reasonable along existing or proposed new uncontrolled access roadways. The numerous driveways and cross streets would result in gaps in potential noise barriers. These driveways and cross streets would prevent the noise barriers from being able to achieve a 7 dBA or greater reduction in sound levels. In most cases, it could make the noise impacts worse by creating an on and off effect as vehicles pass by the openings. Numerous receptor locations are located so close to the existing roadways that they do not provide adequate land to construct a noise barrier. Finally, safety considerations would also prohibit the construction of noise barriers at many of these locations since the noise barriers would limit sight distance for motorists utilizing drives and side roads, creating potentially unsafe traffic conditions.

The feasibility and reasonableness of constructing transit rail noise barriers for locations affected by Alternatives B and C were considered. A transit rail noise barrier approximately the size of a jersey barrier located close to the rail tracks could be effective in reducing transitway noise. The construction of noise barriers for the busway component of Alternative D was found to not be feasible because of the acoustical and engineering restrictions.

Alternatives E and F will impact receptor locations along the Route 2A and Route 2 Bypasses. The construction of noise barriers is not considered to be reasonable for Receptor locations 14 and 29 (Middle Road in Preston and Stony Brook Road in Stonington) because of the low density of receptors (residences) at the impacted receptor locations. The construction of noise barriers was found to be reasonable for one group of receptor sites within Receptor location 28. These receptor sites represent residences on the south side of the Route 2 Bypass between Route 201 and Jeremy Hill Road. A noise barrier could be designed to achieve a 7-10 dBA noise reduction for the first row of receptor sites and at least a 3 dBA reduction for the second row. The preliminary noise barrier design indicated that the barrier height would be

4.2 meters (14 feet) and approximately 500 meters (1,650 feet) long. If Alternative F is selected as the preferred alternative, then the barrier heights and lengths will be optimized.

---

## 3.14 Land Use

This Land Use section discusses land use in the study area and land use impacts from the project. The *Land Use Technical Report* (available for review at Town Halls and public libraries within the study area, and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures.

---

### 3.14.1 Methodology

Seventeen categories of land use were identified in the project area. Land uses were identified through field visits, aerial photo interpretation, ConnDOT video logs, and local area maps. These land use types were delineated based on 1:4,000 scale orthophoto maps. Information on specific commercial uses and planned future development was drawn from the analysis performed for the *Socioeconomic Conditions Technical Report*. Planned future development is limited to planned development along existing corridors. Three Access Management studies recently completed for Preston, Montville and North Stonington, were used to provide additional land use information.

Impacts that are assessed include displacement and relocation of residents and businesses and property takings which result from the acquisition of new right-of-way for each project element. Displacements and property takings were determined through GIS analysis and confirmed through visual examination of planning concepts showing the right-of-way requirements for each project element. The total area and type of land uses affected by each project element were also determined.

Section 3.14.3 identifies impacts which may occur as a result of the implementation of each of the project elements. Generally, the impacts occur as a result of acquisition of new right-of-way for each project element. Therefore project elements which do not require new right-of-way do not have land use impacts. The impacts summarized in Section 3.14.3 include:

- number of displacements<sup>1</sup>,
- land use type displaced,
- number of parcels wholly or partially affected by property takings<sup>2</sup>,
- total area of impacts by land use,

These impacts were determined through GIS analysis. All impacts were confirmed through visual examination of engineering drawings showing the right-of-way requirements for each project element.

---

### 3.14.2 Existing Land Use

The study area includes several densely developed urban areas (Westerly, Norwich, Montville, Waterford and New London) as well as moderate to low-density village centers (North Stonington, Preston City, Poquetanuck, Hallville). Outside the urban areas, the landscape is predominantly rural, consisting of undeveloped land, agricultural land, and low-density residential development. Most residential development occurs in narrow bands along existing roadways, particularly close to Routes 2 and 2A. The majority of commercial development also occurs along Routes 32 and 2, either as scattered and isolated commercial properties or as small commercial districts (particularly in North Stonington).

Table 3.14-1 lists notable land uses within the study area corridors, which are shown on [Figure 3.14-1](#).

<sup>1</sup> Displacements are defined as structures currently used as a residence or commercial establishment that are within the right-of-way of an alternative.

<sup>2</sup> Property Taking is the acquisition of a portion or all of a property by eminent domain

**Table 3.14-1**  
**Land Uses**

<b>Corridor</b>	<b>General Land Uses</b>	<b>Notable Land Uses</b>
Route 2, Norwich	Dense or moderately dense residential and commercial	Bishop Elementary School
Route 2, Preston	Rural residential, occasional commercial	Preston Town Hall and Library Preston Plains School Pequot Trail
Route 2, North Stonington	Rural residential, agricultural, occasional commercial	North Stonington Fire Department North Stonington Elementary School Wheeler High School Gymnasium Holly Green Shopping Center Narragansett Trail
Route 164	Rural residential, agricultural, occasional commercial/institutional: Densely developed village center	Preston City Preston Plains School St. Catherine of Siena Church
Route 32	Moderately to densely developed residential and commercial	Montville Fire Department State Correctional Institute Montville Town Hall St. Bernard's High School Korean Methodist Church Beit Plaza Shopping Center
Transitway	Rural undeveloped, rural residential, densely developed residential in Westerly	North Stonington Fairgrounds Norwich State Hospital SEAT Poquetanuck Fire Department Narragansett and Pequot Trails
Route 2A Bypass	Rural residential and undeveloped	Norwich State Hospital property Church of the Nazarene
Route 2 Bypass	Rural residential and undeveloped	Narragansett Trail

### **3.14.3 Land Use Impacts**

This section summarizes the direct land use impacts likely to occur as a result of the implementation of each of the project elements under consideration. Direct impacts that are assessed include the displacements and property takings which result from the acquisition of new right-of-way for each project element. The area and type of land use affected by each project element is reported. The displacements and property takings reported in this Draft EIS are based on planning concepts for each element. Following selection of a preferred alternative and initiation of project design, measures to avoid or minimize displacements or property takings will be evaluated.

Tables 3.14-2 through 3.14-5 present the potential land use impacts of the Route 2/2A/32 project. Tables 3.14-2 and 3.14-3 summarize land use impacts by project element, and Tables 3.14-4 and 3.14-5 summarize land use impacts by alternative.

The Transitway project element (Tables 3.14-2 and 3.14-3) would cause a total of 17 residential and commercial displacements, the Busway 11 displacements, the Route 2A Bypass 3 displacements and the Route 2 Bypass 17 displacements. The project element requiring the greatest number of displacements is the Route 2 widening, which would require a total of 34 displacements in Preston and North Stonington.

The Transitway would wholly or partially affect 168 parcels, the greatest number of parcels of the project elements. The Route 2 widening from Route 214 to 1-95 would affect 138 parcels, and the Busway would affect 128 parcels. The Route 2 Upgrade in Norwich affects only 6 parcels, the fewest parcels of the project elements, however each property that would be affected would be displaced.

As shown in Table 3.14-3, at 51.56 hectares (127.35 acres) the Transitway has the greatest land area requirements of the project elements, followed by the Route 2 Bypass which has land area requirements of 47.06 hectares (115.27 acres). The upgrades of Routes 32 and 164 are entirely within the right-of-way and therefore do not require any additional land.

**Table 3.14-2**  
**Summary of Land Use Impacts by Project Element by Town**

Project Element	Town	Number of parcels Affected	Number of Displacements*	Total Land Area Required** hectares (acres)
Transitway	Preston	40	6	10.89 (26.90)
	Ledyard	25	0	9.79(24.18)
	North Stonington	75	10	21.57 (53.28)
	Stonington	9	2	2.14 (5.29)
	Westerly	19	0	7.17(17.72)
Busway	Ledyard	25	0	0.06 (0.14)
	North Stonington	75	10	21.57 (53.28)
	Stonington	9	2	2.14 (5.29)
	Westerly	19	0	7.17(17.72)
Route 2A Bridge	Montville	0	0	0
Southern Transit Bridge	Montville	2	0	0.3 (0.8)
	Preston	2	2	1.3 (3.2)
Northern Transit Bridge	Montville	2	0	1.6 (3.8)
	Preston	2	0	1.4 (3.5)
NEC Stations	New London	0	0	0
	Connecticut College	1	0	0.2 (0.4)
	Waterford	0	0	0
	Mohegan Sun	0	0	0
	Norwich West	1	1	0.15 (0.5)
	I-395	1	1	1 (2.5)
Transitway Stations	Westerly	0	0	0
	I-95	1	0	1 (2.5)
	North Stonington	1	0	0.3 (0.7)
	Foxwoods	1	0	0.15 (0.3)
	Poquetanuck	1	1	0.2 (0.5)
	Norwich State Hospital	0	0	0.8 (2)
	Norwich East	0	0	0
Route 32 Upgrade	Montville	0	0	0
	Waterford	0	0	0
Route 164 Upgrade	Preston	0	0	0
Route 2 Upgrade – Norwich	Norwich	6	6	0.076 (0.188)
Route 2 Upgrade – Route 214 to I-95	Ledyard	1	0	< 0.01 (0.02)
	North Stonington	87	4	3.67 (9.06)
Route 2 Widening – Preston	Preston	76	12	5.27 (13.02)
Route 2 Widening – Route 214 to I-95	Ledyard	1	0	0.75 (1.85)
	North Stonington	137	22	30.36 (75.00)
Route 2A Bypass	Preston	28	3	16.57(40.94)
Route 2 Bypass	North Stonington	36	12	32.88 (81.21)
	Stonington	17	5	13.78 (34.06)

\*Number of displacements summarized here excludes outbuildings specified in the *Land Use Technical Report* and displayed in Table 3.14-3.

\*\*Land within new right-of-way (for existing roads, this is land outside of existing right-of-way).

**Table 3.14-3**  
**Summary of Land Use Impacts by Project Element**

Project Element	Number of parcels Wholly or Partially Affected	Number of Displacements			Total Area of all Land Takings hectares (acres)
		Residential	Business /Municipal	Outbuildings	
Transitway	168	14	4	9	51.56 (127.35)
Busway	128	8	4	9	30.95 (76.42)
Route 2A Bridge	0	0	0	0	0
Southern Transit Bridge	2	2	0	0	1.6 (4.0)
Northern Transit Bridge	2	0	0	0	3.0 (7.3)
NEC Stations	3	0	1	0	1.35 (3.33)
Transitway Stations	4	0	0	1	1.95 (4.81)
Route 32 Upgrade	0	0	0	0	0
Route 164 Upgrade	0	0	0	0	0
Route 2 Upgrade – Norwich	6	6	0	0	0.76 (0.188)
Route 2 Upgrade – Route 214 to I-95	88	3	1	4	3.67 (9.09)
Route 2 Widening – Preston	76	11	1	3	5.27 (13.01)
Route 2 Widening – Route 214 to I-95	138	15	7	1	31.11 (76.87)
Route 2A Bypass	28	3	0	2	16.57 (40.94)
Route 2 Bypass	53	16	1	4	47.06 (115.27)

Table 3.14-4 displays the impacts of each alternative on the various land use categories. Alternative E has the greatest impact on residential and commercial uses, while Alternative F has the greatest effect on land which is currently undeveloped. The impacts to the other land use categories are minimal or non-existent for all of the alternatives. As shown in Tables 3.14-4 and 3.14-5, Alternative F has the greatest land requirement of the alternatives, at 68.5 hectares (169.2 acres) while Alternative D has the lowest land area requirement of the build alternatives, at 36.45 hectares (90.07 acres).

### Recreational Impacts

Each of the Build alternatives will affect recreational resources in addition to the public recreational facilities described in Section 3.10. Two trails maintained by the Connecticut Forest and Park Association (“blue-blazed trails”) occur within the study area. The Narragansett Trail, which extends from Lantern Hill in Ledyard to Voluntown and currently crosses Route 2 at Cossaduck Road, is affected by all of the alternatives. Alternatives B, C and D would cross this trail in 2 locations. The light rail option would substantially interrupt the trail, and would require its relocation between Lantern Hill and Route 201. Alternative E would widen Route 2 at the existing signalized

crossing, with negligible effect on the trail. Alternative F would cross the trail with a new 4-lane divided roadway, and would require that the trail be relocated.

Alternatives B and C also cross the Pequot Trail at Lincoln Park Road in Preston. A pedestrian crossing of the trail could be combined with the grade-protected roadway crossing, and would not affect use of the trail.

### **Active Farms**

Each of the alternatives would affect land in active agricultural use. Alternatives B and C would have the greatest effect and would result in the loss of approximately 2 acres of active agricultural land. The majority of this impact would be to a farm complex located south of Route 2, east of Shewville Road, but a farm on Harris Fuller Road in Preston would also be affected. The transitway would potentially eliminate access to some farm fields. Alternative E would affect strips of land in active farms along Route 2. Alternative F would have the least effect on active farmland, and would primarily affect farmed land in Stonington in the Wheeler farm area.

### **Public Buildings**

Alternatives B, C, D, and E would, to varying degrees, affect public buildings in North Stonington. Alternatives B, C and D include upgrading Route 2, which would result in an encroachment onto public school lands and the North Stonington Fire Station. Alternative E, due to the widening of Route 2, would encroach more substantially into the school and fire station properties. Expansion of the right-of-way and pavement would require the displacement and relocation of the Fire Station. The edge of pavement would encroach approximately 22.5 meters (75 feet) closer to the Fire Station, and could result in insufficient distance to back a fire truck into the building. The edge of pavement would encroach a maximum of 15 meters (50 feet) closer to the Elementary School. The need for additional clear right-of-way beyond the limit of pavement would eliminate some parking spaces in front of the Elementary School.

**Table 3.14-4**  
**Summary of Impacts to Land Use Categories by Alternative (hectares/acres)**

Land Use	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Residential	0	1.65 (4.08)	1.65 (4.08)	1.17 (2.88)	6.40 (15.81)	5.48 (13.54)
Commercial	0	1.44 (3.56)	1.44 (3.56)	0.84 (2.07)	2.57 (6.35)	0.40 (0.99)
Industrial	0	0.66 (1.63)	0.66 (1.63)	0.66 (1.63)	0	0
School	0	0.02 (0.05)	0.02 (0.05)	0.02 (0.05)	1.12 (2.77)	0.10 (0.25)
Religious Institution	0	0	0	0	0.004 (0.01)	0.004 (0.01)
Agricultural Land	0	1.96 (4.84)	1.96 (4.84)	0.58 (1.43)	1.35 (3.33)	0.39 (0.96)
Agricultural Buildings	0	0.08 (0.2)	0.08 (0.2)	0	0.14 (0.35)	0.14 (0.35)
Public Buildings	0	0.07 (0.17)	0.07 (0.17)	0	0.04 (0.10)	0.04 (0.10)
Emergency Services	0	0	0	0	0.16 (0.40)	0
Cemetery	0	0	0	0	0	0
Resort	0	0.04 (0.1)	0.04 (0.1)	0	0.02 (0.05)	0
Parking Lot	0	0.78 (1.93)	0.78 (1.93)	0	0	0
Other	0	0.16 (0.4)	0.16 (0.4)	0.16 (0.4)	0.48 (1.19)	0.48 (1.19)
Planned Future Development	0	0.48 (1.19)	0.48 (1.19)	0.03 (0.07)	0.28 (0.69)	0
Undeveloped	0	51.20 (126.47)	54.20(133.24)	32.99 (81.49)	40.38 (99.74)	61.47 (151.83)
<b>TOTAL</b>	<b>0</b>	<b>58.54 (144.60)</b>	<b>61.54 (151.37)</b>	<b>36.45 (90.02)</b>	<b>52.94 (130.77)</b>	<b>68.50 (169.20)</b>

**Table 3.14-5**  
**Summary of Land Use Impacts by Alternative**

Alternative	Number of Displacements (residential and commercial)	Number of parcels Affected	Total Area of Property Takings hectares (acres)
Alternative A	0	0	0
Alternative B	17/3	263	58.54 (144.60)
Alternative C	19/3	265	61.54 (151.37)
Alternative D	17/4	225	36.45 (90.02)
Alternative E	29/8	242	52.94 (130.77)
Alternative F	30/2	157	68.50 (169.20)

### 3.15 Relocations

This section considers the number and type of relocations that are estimated for each of the alternatives. Relocations are considered to be any property on which the primary structure (residential or commercial) would be within the conceptual right-of-way of that alternative. The *Socioeconomic Impacts Technical Report* provides additional information on relocations and costs.

All property acquisitions will be subject to the provisions of the Uniform Relocation Assistance and Real Property Act of 1970. The fair market value for each property will be established by a licensed professional appraiser based on comparable sales. The property owner will be afforded the opportunity of accompanying the appraiser on a site walk of the property.

All displaced individuals, families and businesses will be eligible for relocation assistance and other benefits such as moving costs, monetary benefits for the purposes of replacement housing, and defrayed payment of higher mortgage interest payments.

**Table 3.15-1**  
**Potential Relocations (number of residential /commercial properties)**

Municipality	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Norwich	0/1	0/1	6/0	0	0
Montville	0	0	0	0	0
Waterford	0	0	0	0	0
Preston	2/0	6/0	0	14/1	14/1
Ledyard	0	0	0	0	0
North Stonington	11/3	11/3	11/3	15/7	12/0
Stonington	0/2	0/2	0/2	0	4/1
Westerly	0	0	0	0	0
Total Relocations	13/6	15/6	17/5	29/8	30/2
Relocation Costs	\$5,055,900	\$5,055,900	\$4,607,700	\$8,351,000	\$5,180,200

Potential relocations range from 13 residences and 6 commercial businesses for Alternative B, with an estimated relocation cost of \$5,055,900, to as many as 30 residences and 2 commercial businesses, and an estimated cost of \$5,180,200, for Alternative F.

---

### **3.16 Socioeconomic Conditions**

This section summarizes the existing socioeconomic conditions and project impacts in the study area. The *Socioeconomic Technical Report* (available for review at Town Halls and public libraries within the study area and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures.

---

#### **3.16.1 Methodology**

The socioeconomic information has been compiled from analyzing municipal and regional data from available secondary sources, interviewing knowledgeable local public officials and conducting surveys of existing business uses along the study area's major transportation corridors. Property tax assessment information and property sales data were obtained to measure current and historical real estate values.

---

#### **3.16.2 Existing Socioeconomic Conditions**

Defense-related manufacturing, tourism and entertainment, health care, and post-secondary education anchor the region's core economy. The region is also recognized as a center for marine research and inter-modal shipping, and is also the center of an emerging biotechnology industry. Recent employment growth in the tourism sector, specifically the emergence of the gaming industry, has replaced substantial job losses which accompanied the decline of defense manufacturing, and the region's other traditional non-durable goods manufacturing sectors, during the late 1980s.

Demographic patterns indicate that the region has historically experienced slow rates of population growth. Population declined from 1990 to 1996 as a result of poor economic conditions at the start of the decade and the closure or downsizing of nearby military installations. Since 1980, the study area population has declined in the Cities of Norwich and New London and grown in the surrounding rural townships. Population projections predict that this trend should continue over the next several years.

Residential, commercial and vacant land values along the major highway corridors in the study area are comparatively modest in most locations. Sales activity, other than transactions initiated by the Mashantucket Pequot Tribe, has been limited. Existing commercial development along the highway corridors supports 236 existing businesses, roughly 3.5 percent of all private establishments within the study area.

The large land holdings by the Mohegan and Mashantucket Pequot Tribes, including both historically owned and recently acquired properties, could physically support a substantial level of new development. The Tribes' financial capacity to develop these holdings, as well as their exemption from typical land use regulations within their reservations, creates the possibility of future large-scale development.

The region has several existing "neighborhood" concentrations of low-income and minority residents at the Census Tract and Block Group level. Most of these concentrations are along the western and southern sections of the study area, near urbanized areas. Several distinct concentrations of residential and mixed residential and neighborhood commercial uses are also along the Route 2, 2A, 32 and 164 corridors. Finally, most of the municipal facilities and schools operated by the nine study area communities are either on or near the Route 2, 2A and 32 corridors. These routes are used heavily by public school buses.

---

### **3.16.3 Socioeconomic Impacts**

Socioeconomic impacts were analyzed for each of the alternatives. The analysis included both direct and secondary (indirect) impacts, as shown in Table 3.16-1.

**Table 3.16-1**  
**Socioeconomic Impact Analysis Components**

Direct Impacts	Acquisition and relocation costs	Includes the estimated costs of right-of-way acquisition and the costs of acquiring and relocating individual residences or businesses located in the right-of-way.
	Construction costs and jobs	Estimated cost to build the transportation element
	Operating costs and jobs	Annual total economic output associated with operating and maintaining the element
	Impacts to local property taxes	The loss of tax revenue attributed to removal of private property as a result of right-of-way acquisition
Secondary Impacts	Impact on property values	Change (positive or negative) in the market values of adjacent or nearby property as a result of the element
	Land use impacts	Effect that the element has on adjacent or nearby land uses
	Impacts on businesses	Effect that the element has on business due to change in traffic patterns
	Indirect construction cost impacts	Spin-off economic benefits resulting from the circulation of direct construction spending in the local economy. Estimated through the use of economic multipliers.
	Population and housing growth	Effect that the element has on housing trends in the study area
	Community character and cohesion	Impact of the element on the sense of place that residents have for their neighborhood or community
	Local services and facilities	Impact of the element on the delivery of municipal services (public safety, public works, education, etc.) or on existing public facilities

Impacts are quantified to the extent possible, measured in terms of economic value changes, employment, land area, number of structures, etc. However, because of the complex nature of the proposed improvements and the lack of reliable comparable or measurable empirical data, some impacts cannot be easily quantified.

Acquisition and relocation costs for each element are estimated using average assessed values for land and improved properties for each community, as analyzed and reported in the *Socioeconomic Technical Report*, and adjusted to reflect equalized valuation. Undeveloped land values are estimated using

residential land values to better reflect the potential cost of acquisition. Actual acquisition and relocation costs will be determined according to ConnDOT policy appraisal and negotiation at the time of taking and could vary from the estimates presented. Property tax impacts are estimated by applying recent property tax rates (millage) to the total value calculated for each major land use in each community.

### 3.16.3.1 Direct Impacts

Each of the alternatives would have direct impacts, both positive and negative, to the state, regional, and local economies. As shown in Table 3.16-2, Alternatives B and C would have the largest regional economic benefits, provided by construction and operations jobs and spending, and would have the least impact on municipalities through reduction of property tax revenues. Alternative E would have the lowest regional impact, result in the greatest property tax reductions, and have the highest estimated right-of-way acquisition costs.

**Table 3.16-2**  
**Summary of Economic Impacts**

Alternative	Relocation and Right-of-Way Cost	Construction Spending* (\$ million)	Total Jobs Throughout Region During Construction	Annual Operations Spending (\$millions)	Operations Jobs	Property Tax Reduction
A	0	0	0	0	0	0
B	\$7,039,300	\$599	11,740	\$10.5	52	\$135,500
C	\$7,039,300	\$599	11,740	\$10.5	52	\$135,500
D	\$6,112,600	\$108	2,684	\$4.4	0	\$122,000
E	\$9,302,809	\$69	1,783	0	0	\$157,800
F	\$5,523,900	\$95	2,443	0	0	\$105,400

\* Estimated for the light rail option

### 3.16.3.2 Indirect Impacts

Indirect impacts of each of the alternatives are summarized in Table 3.16-3. None of the alternatives is anticipated to have a substantial impact on property values or land use, although there may be minor positive and negative impacts to the value of properties directly abutting a corridor, and some alternatives may enhance the value of commercial property relative to residential. Alternatives that result in increased traffic on Route 2 are likely to benefit those convenience stores, gas stations, and businesses that rely on pass-through traffic, although increased congestion will adversely affect access to those businesses under Alternatives A, B, C, and D. Alternative F,

which will decrease traffic on Route 2, is likely to have an adverse effect on some businesses. Alternative E, by reducing congestion and improving traffic flow, would likely improve access to businesses along Route 2.

Each of the alternatives is likely to affect community cohesion to some degree. Alternative B and C, and to a certain extent D, are likely to divide neighborhoods in North Stonington and Preston (Poquetanuck Village and Hallville), and would contribute to the current effect of Route 2 in dividing North Stonington. Alternative F would divide neighborhoods in Stonington and North Stonington along Stony Brook and Jeremy Hill Roads, and along Route 201. Both the Route 2 and Route 2A Bypasses would continue to allow access along existing roads, but would present a visual and physical barrier within the neighborhood. Alternatives E and F would improve community cohesion in Poquetanuck, by reducing through traffic volumes.

All alternatives (B, C, D, E, F) are likely to improve emergency vehicle access along Route 2 by upgrading or widening the existing road to include shoulders and permit passing.

**Table 3.16-3**  
**Indirect Socioeconomic Impacts**

Impact	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Property Values	Increased traffic on Rt 2 likely to enhance commercial property values and decrease residential	Positive and negative, confined to properties adjacent to the alignment Same As Alt. A	Positive and negative, confined to properties adjacent to the alignment Same as Alt. A	Positive and negative, confined to properties adjacent to the alignment Same as Alt. A	Minor impacts to properties adjacent to the bypass	Minor impacts to properties adjacent to the bypass
Land use	None	No change	No change	No change	No change	No change
Businesses	Increased traffic on Route 2 likely to enhance business	Increased traffic on Route 2 likely to enhance business	Increased traffic on Route 2 likely to enhance business	Increased traffic on Route 2 likely to enhance business	Increased traffic and improved access on Route 2 likely to enhance business	Decreased traffic on Route 2 likely to adversely affect business
Housing Growth	None	Negligible	Negligible	Negligible	Negligible	Negligible
Community Character and Cohesion	None	Transitway may increase the effect of Route 2 in dividing North Stonington; may divide neighborhoods in Poquetanuck and Hallville	Transitway may increase the effect of Route 2 in dividing North Stonington; may divide neighborhoods in Poquetanuck and Hallville	Busway increase the effect of Route 2 in dividing North Stonington	Widening Route 2 not likely to contribute to the separation of neighborhoods along Rt 2 in Preston or North Stonington. Rt 2A Bypass will improve community cohesion/ character in Poquetanuck	Rt 2A Bypass will improve community cohesion/ character in Poquetanuck; Rt 2 Bypass will improve community cohesion in North Stonington, but will affect neighborhood cohesion along Jeremy Hill Road and Route 201
Services and Facilities	Increased traffic congestion likely to impede movement of public safety vehicles	Upgrading Route 2 will improve movement of public safety vehicles	Upgrading Route 2 will improve movement of public safety vehicles	Upgrading Route 2 will improve movement of public safety vehicles	Widening Route 2, and bypassing Route 2A, will improve movement of public safety vehicles	Route 2A Bypass, and decrease of traffic congestion on Route 2, will improve movement of public safety vehicles

---

#### 3.16.4 Environmental Justice

In accordance with Executive Order 12898 and subsequent procedures developed by the U.S. Department of Transportation, activities that have the potential to generate a disproportionately high and adverse effect on human health or the environment shall include explicit consideration of their effects on minority populations and low-income populations. In making an assessment of whether or not Environmental Justice has been served, information regarding race, color or national origin, and income level should be obtained where relevant, appropriate and practical. Specific consideration should be given to those populations which are most directly served or affected by the proposed action.

The *Socioeconomic Technical Report* describes the locations within the Study Area that contain populations that meet the criteria for inclusion under Executive Order 12898 and provides detailed data on income and demographics. As the data show, 4.3 percent of the total population of the Study Area was identified as non-white. The communities with the highest concentrations of minority residents were New London (27.3 percent), Norwich (8.7 percent), and Montville (6.8 percent). Overall, 7.3 percent of the Study Area's total population was considered to be living below the poverty level in 1990. Municipalities with particularly high concentrations of persons below the poverty level include the cities of New London (13 percent) and Norwich (11.5 percent) and the Town of Westerly (6.5 percent).

None of the proposed alternatives have a negative impact on low income/minority populations in the Study Area. The alternatives vary in the potential benefit to low income or minority populations.

Alternatives B and C would provide the greatest potential positive benefit. The implementation of commuter rail services to/from New London and Norwich from stations located within or nearby those Census Tracts identified as having high concentrations of low income households, provides positive potential benefit by improving accessibility to additional employment opportunities over a larger geographic area. The interconnection between the commuter rail and the transitway provide further benefit by providing improved access to employment opportunities at the casino complexes. Other alternatives do not directly connect low income population centers with these employment centers, but provide improved vehicular access.

---

### **3.17 Hazardous or Contaminated Materials**

There is the potential for the discovery of hazardous or contaminated materials (HCM) within portions of the study corridors. This potential exists because of previous uses of the land as manufacturing, industrial, or commercial uses associated with potentially hazardous materials. This section evaluates existing oil and/or hazardous materials within the study area, describes the project impacts to these sites, and discusses potential mitigation measures. The *Hazardous Materials Technical Report* (available for review at Town Halls and public libraries within the study area and at ConnDOT) contains additional detailed information on existing conditions, impacts and mitigation measures.

---

#### **3.17.1 Methodology**

Several sources of information were used to identify known or potential hazardous or contaminated sites within the study corridors. A computer database service that contains federal and state files regarding potential hazardous or contaminated waste sites was one source. Interviews with local Fire Marshals and a review of available files were also conducted to confirm sites identified in the database search, as well as identify additional potential release areas. In addition, a general windshield survey of the study area was conducted to observe sites identified in the environmental database search, to identify obvious commercial and industrial areas, and to note waste or stockpiles on undeveloped land that may also represent potential undocumented release sites.

---

#### **3.17.2 Existing Locations**

The screening analysis identified numerous known or potential hazardous/contaminated sites. The majority of the sites identified as potential sources of contamination are within developed industrial or commercial zones.

---

#### **3.17.3 Hazardous Material Impacts**

Impacts on properties known or expected to contain hazardous or contaminated materials were assessed as the potential for encountering such sites as a result of the acquisition of new rights-of-way or construction activities within the rights-of-way for each project element. Concern over encountering such sites is related to the potential costs for cleanup as well as the liability that ConnDOT could assume by purchasing contaminated

properties. The number of sites within the area impacted by each alternative is used as an estimate of financial risk associated with that alternative.

The number of hazardous or contaminated sites potentially encountered by each project element is shown in Table 3.17-1. A summary of the composite impacts for the No Action (Alternative A) and the five build alternatives (Alternatives B-F) is provided in Table 3.17-2.

**Table 3.17-1**  
**Hazardous or Contaminated Site Impacts by Project Element**

Project Element	No. of OHM Sites Impacted <sup>1</sup>	Environmental Concerns <sup>2</sup>
Transitway	45	CERCLIS, RCRAGN, RCRANLR, STATE SITE, UST, LUST, potential contaminants associated with existing railway right-of-way
Busway	34	RCRAGN, RCRANLR, STATE SITE, UST, LUST
NECR	22	Potentially contaminated railroad ballast: RCRA, RCRAGN; RCRANLR, RCRACOR, State Site, UST, LUST
Rt 2A Bridge	1	Potentially contaminated river sediments
Southern Transit Bridge	1	Potentially contaminated river sediments
Northern Transit Bridge	1	Potentially contaminated river sediments
NECR Stations	3	CERCLIS, RCRACOR, RCRAGN, STATE SITE, potential contaminants associated will existing railway right-of-way
Transitway Stations	13	RCRAGN, RCRANLR, UST, LUST, potential contaminants associated will existing railway right-of-way (Westerly Station only)
Busway Stations	10	
Rt 32 Upgrade	23	CERCLIS, RCRACOR, RCRAGN, RCRANLR, STATE SITE, UST, LUST
Rt 164 Upgrade	3	STATE SITE, UST
Rt 2 Upgrade – Norwich	4	RCRAGN
Rt 2 Upgrade – Rt 214 to I-95	9	RCRAGN, STATE SITE, UST, LUST
Rt 2 Widening – Preston	5	RCRAGN, UST
Rt 2 Widening – Rt 214 to I-95	9	RCRAGN, STATE SITE, UST, LUST
Rt 2A Bypass	3	RCRAGN, UST, SWL
Rt 2 Bypass	5	RCRAGN, UST, SWL

1 Several sites are listed in more than one element, due to the overlap of corridors

2 CERCLIS – Comprehensive Environmental Response, Compensation and Liability Information System

RCRAGN – Resource Conservation and Recovery Act Generator

RCRANLR – Resource Conservation and Recovery Act – No Longer Registered Generator

State Site – Connecticut State List of Hazardous Waste Facilities

UST – Underground Storage Tank

LUST – Leaking Underground Storage Tank

SWL – Solid Waste Landfill

Alternative A (No Action) would not encounter contaminated sites. Of the build alternatives, Alternative F would encounter the smallest number of sites

(39); the majority of those potential impacts would occur within the Route 32 Upgrade (23 sites). Alternative E would encounter more contaminated sites than Alternative F (43 versus 39 sites, respectively), due to the number of sites along existing Route 2.

Alternative D would impact 45 hazardous or contaminated sites. Most of the sites are associated with the Busway element (34 sites). Alternatives B and C result in a similar number of sites encountered; Alternative B contains 77 sites and C contains 78 sites. The majority of potential impacts come from sites located in the Transitway element (45 sites).

**Table 3.17-2**  
**Hazardous or Contaminated Sites Encountered by Project Alternative**

Alternative	Sites Encountered
A	0
B	77
C	78
D	45
E	43
F	39

#### **3.17.4 Hazardous Material Mitigation Measures**

Specific mitigation measures for contaminated or hazardous materials will be identified once the preferred alternative is identified and more detailed field investigations are performed. Standard ConnDOT protocols for additional studies will be followed, along with all relevant state and federal laws. This includes characterization of the potential contamination and an assessment of the environmental risk associated with each site including potential worker exposure, environmental contamination that violates current regulations, and liabilities associated with a partial or full acquisition for right-of-way purposes.

Potential mitigation measures include avoidance by re-adjusting the centerline or other changes in the project design. Depending on the extent of contamination, cleanup or on-site containment are also possible measures.

---

### **3.18 Construction**

Construction impacts associated with a transportation project are by definition those impacts which are temporary or short-term in nature and which occur only during construction. Long-term impacts resulting from operation or maintenance of the project are frequently different and are covered in other sections of this document under the particular resource category. This section provides an overview of the types of construction impacts and compares the extent of impacts that potentially may occur with each of the various project elements.

---

#### **3.18.1 Construction Impacts**

Construction impacts associated with each of the build alternatives are qualitatively similar and represent short-term disturbances related primarily to noise, equipment exhaust and dust emissions, erosion and sedimentation, traffic, human presence, and visual intrusions. The length of each element is an estimate of the duration and magnitude of construction. Additional details of the impacts analysis are available in the *Construction Impacts Technical Memorandum* (available for review at Town Halls and public libraries in the study area, and at ConnDOT). Long-term impacts to the resources described below are provided in Sections 3.2 through 3.17.

##### **3.18.1.1 Air**

Construction activities may result in temporary adverse air quality impacts. The two primary pollutant sources during construction would be construction equipment and exposed soils in unvegetated areas.

Air pollutants emitted from diesel and gasoline powered construction equipment including vehicles would include NO<sub>x</sub>, CO, hydrocarbons, and particulate matter. Emissions from construction equipment may result in elevated ambient concentrations within the immediate vicinity of construction activities for short periods of time, but would not be expected to have a substantial long-term impact.

Particulate matter (dust) would be emitted as a result of grubbing, grading, excavating, hauling, and blasting operations.

##### **3.18.1.2 Water Quality/Streams**

Activities associated with construction would likely require grading and blasting of bedrock material in some areas. The grading would include stripping existing vegetation, followed by excavation and filling. This

construction would result in nearly complete reworking and/or removal of both surficial and subsoils along the proposed alternative. Exposure of previously vegetated soils could potentially lead to erosion and runoff into adjacent streams or other water bodies if not properly controlled.

Construction of new bridge piers in the Thames River could result in the discharge of sediments to the river, resulting in increased turbidity downstream of the work zone. Work within the river will be controlled through the use of BMPs.

#### **3.18.1.3 Wildlife**

Human presence along the new bypass during construction and the associated construction noise may displace some species of wildlife from the edge of the right-of-way. The loud noises associated with construction also could mask territorial vocalizations of bird species near the highway, interfering at least temporarily with breeding. Amphibians, which breed more commonly at dusk or night, are less likely to be indirectly affected.

#### **3.18.1.4 Noise**

Construction activities could result in substantial, but temporary, noise impacts to sensitive receptors at various locations along the project's length. Noise levels in the vicinity of construction activities would vary widely depending on the type and number of pieces of construction equipment active at any one time and whether blasting was required.

It is expected that  $L_{eq}$  noise levels exceeding 67 dBA could occur up to 152 meters (500 ft) away from construction activities. Under the bypass options, construction noise would, in some areas, be occurring near residences presently experiencing low noise levels. Construction noise would affect the greatest number of people along upgrade and widening corridors. In general construction noise would be restricted to daylight hours.

#### **3.18.1.5 Traffic**

Construction of any of the build alternatives would create the potential for increased construction truck traffic on secondary roads. Retail establishments may also experience some loss of business due to the difficulty of access. Traffic delays and other types of congestion are also largely unavoidable but would be short term and localized in nature.

#### **3.18.1.6 Visual**

Some short-term visual impacts would also occur during construction as land clearing and earth moving occurs. Some views would be disrupted by the presence of temporary construction or access roads that may be needed.

#### **3.18.1.7 Employment**

Construction related employment opportunities would be created during construction of the project. These would be short term in nature and terminate upon completion of the project. The actual number of jobs is directly related to project costs. The jobs would include direct (on-site) and in-direct (off-site construction related) employment opportunities, as well as induced employment (i.e., jobs created by income obtained from direct and indirect employment being spent in the local economy).

---

#### **3.18.2 Summary**

The types of construction impacts associated with each of the five build project alternatives (Alternatives B-F) would be similar in nature. In most cases the potential for impact will be directly related to the difficulty and length of highway or bridge construction. For example, project elements requiring blasting or pile driving and work near sensitive receptors will have potentially greater noise impacts than those that do not. Similarly, alternatives requiring a major bridge construction in the Thames River (Alternatives C, E, and F) have a greater potential for water quality impacts to the river than those that do not. In general, visual and traffic impacts would be greater with alternatives involving highway widening or upgrade elements (in particular Alternatives D-F) as these activities will take place typically near developed areas and along established highways. Local employment opportunities would be directly related to project costs.

In comparison, there would be no construction impacts with the No-Action alternative (Alternative A).

---

#### **3.18.2 Construction Mitigation Measures**

Mitigation measures would be provided during construction to reduce effects on natural resources and communities. Specific mitigation measures and BMPs are described below.

### **3.18.2.1 Fugitive Dust/Air Quality**

Dust emitted during construction activities will be controlled by treating unpaved areas in the construction zone, covering loads on all open trucks, and seeding all unvegetated areas as soon as practicable. In addition, ensuring that all vehicles and other equipment are properly maintained and their emission systems are working properly will minimize exhaust emissions.

### **3.18.2.2 Water Quality**

Water quality impacts during construction would be minimized through sound erosion and sediment control practices (BMPs). The contractor will be required to submit an Erosion and Sediment Control Plan to the CTDEP as part of a Storm Water Discharge Permit. Section 1.10 “Environmental Compliance,” including BMPs from ConnDOT *Form 815, Standard Specifications for Roads, Bridges, and Incidental Construction* will be followed. All erosion and sediment controls, such as silt fences, hay bales, mulch, soil stabilization blankets, and turbidity curtains would be installed and maintained in accordance with the *Connecticut Department of Transportation On-Site Mitigation for Construction Activities*, 1994, and the *Connecticut Guidelines for Soil Erosion and Sediment Control Measures*.

### **3.18.2.3 Noise**

Ensuring that mufflers have been installed and that they are being properly maintained will mitigate noise impacts associated with construction equipment. Restricting the hours of operation is another means of minimizing noise impacts. The ConnDOT Standard Noise Provision will be included in the construction contract, and states the following:

“1.10.05 – Noise Pollution: the Contractor shall take measures to control the noise intensity caused by his construction operations and equipment, including but not limited to equipment used for drilling, pile driving, blasting, excavation or hauling.”

“All methods and devices employed to minimize noise shall be subject to the continuing approval of the Engineer. The maximum allowable level of noise at the nearest residence or occupied building shall be 90 decibels on the “A” weighted scale (dBA). Any operation that exceeds this standard will cease until a different construction methodology is developed to allow the work to proceed with the 90 dBA limit.”

#### **3.18.2.4 Maintenance and Protection of Traffic**

The maintenance and protection of traffic throughout the construction period will be extensively coordinated with local officials and business owners to avoid or minimize inconvenience. A Traffic Management Plan, including appropriate construction signage and uniformed officers, will be put into place to minimize traffic-related impacts.

#### **3.18.2.5 Environmental Risk**

ConnDOT has developed a specialized contractual system enabling ConnDOT to respond effectively to unanticipated encounters with hazardous or contaminated materials during project construction. Preconstruction sampling protocols, which are implemented at high-risk sites, have been established (see also Section 3.17 for details of site screenings).

Potential disturbance of wildlife and temporary visual impacts are largely unavoidable and no mitigation is proposed.

---

### **3.19 Energy**

Energy impacts of a transportation project include demands for diesel and gasoline fuels used in construction, maintenance and operation. Energy demands for construction are typically directly proportional to the length of the highway, number of lanes, and any special features or structures like bridges. Difficult physical features like ledge also increase the energy requirement. Once a project is completed and open to traffic, there will be long-term energy demands associated with the maintenance of the highway including snow plowing, sanding, mowing of medians and shoulders, routine repairs, and maintenance of drainage structures. Finally operation of the new highway, meaning use of the facility by vehicular traffic, also requires energy consumption but normally in a more efficient fashion than under frequently pre-existing, congested conditions.

---

#### **3.19.1 Energy Impacts**

Short-term energy impacts associated with construction of any of the build alternatives were evaluated qualitatively and were assumed to be directly proportional to the length of highway, number of lanes, and the need for special structures like bridges.. Rough estimates can be made for construction energy based on the construction cost for the various project elements.

Experience on other transportation projects indicates there is a direct relationship between construction cost and fuel requirements.

Energy impacts are assumed to be proportional to the length of new construction and special features that require additional energy to construct. A summary of the composite impacts for the No Action (Alternative A) and five build alternatives (Alternatives B-F) is provided in Table 3.19-1. Additional details of the impact analysis are available in the *Energy Impacts Technical Memorandum* (available for review at Town Halls and public libraries within the study area and at ConnDOT)

In general, short-term energy requirements during construction in the form of gasoline and diesel fuel would be less with an alternative incorporating primarily up-grades and widenings of existing roadway segments (Alternatives E) as compared to one incorporating both bypass elements (Alternative F). Construction energy requirements are also predicted to be higher for the more costly rail alternatives (Alternatives B and C). Given the magnitude of the various project alternatives and the fact that Connecticut utilizes approximately 1.32 billion gallons of fuel per year, none of the construction energy requirements for the five build alternatives would be considered significant.

Long-term energy impacts were estimated based on the ability of each alternative to provide a more efficient flow of traffic, and the ability of a mass transportation alternative to reduce automobile traffic. Long-term energy requirements for maintenance are also related to the total length of the roadway/transit element.

Alternative C would have the highest long-term energy requirements for maintenance, with 97.6 km (60.4 mi) of rail and roadways that would be maintained by ConnDOT. Alternative E would have the lowest long-term energy requirements for maintenance, with 44.4 km (27.8 mi) of roadway to be maintained. These estimates assume that ConnDOT would continue to maintain existing Routes 2A and 2.

Alternatives B and C provide the most long-term energy benefits of mass transit, as these remove a greater volume of automobiles (13,500) from area roadways than does Alternative D (10,400). However, these alternative do not reduce congestion on existing area roadways, and therefore have a negligible energy benefit. Alternative E provides the highest long-term energy benefit, due to the elimination of congestion on all area roadways. Although Alternative F also eliminates congestion, it results in an increase in vehicle miles traveled and has a slightly lower benefit.

The No Action (Alternative A) would result in the continued inefficient use of energy due to traffic congestion. However, no additional consumption of energy for construction would be needed.

**Table 3.19-1  
Summary of Energy Impacts**

Alternative	Construction Cost	Length* (km/mi)	Long-Term Energy Efficiency Rank**		Qualitative Impacts
			Maintenance	Congestion	
A	N/a				Continued inefficient energy use due to traffic congestion.
B	\$599 million light rail \$3.5 billion-monorail	96.1 (60.1)	2	2	Additional energy demands for construction (short term) and maintenance (long term) but mass transit & freer flow of traffic ensures future energy efficiency during operation.
C	\$701 million-light rail \$3.7 billion-monorail	96.7 (60.4)	1	3	Same as Alt. B.
D	\$108 million	53.8 (33.6)	3	1	Same as Alt. B.
E	\$93 million	44.4 (27.8)	5	5	Additional energy demands for construction (short term) and maintenance (long term) but freer flow of traffic ensures future energy efficiency during operation.
F	\$131 million	55.1 (34.4)	4	4	Same as Alt. E.

\* Length includes all rail, transit, and roadways maintained by ConnDOT

\*\* Rank from most efficient (5) to least efficient (1)

### 3.19.2 Energy Mitigation

Mitigation for energy impacts includes all practical measures to minimize the use of energy during construction, operation and maintenance of the chosen project alternative. The latest design standards will be incorporated into the project to ensure the greatest efficiency of vehicular flow or movements by rail or other transit alternative.

This Page Intentionally Left Blank